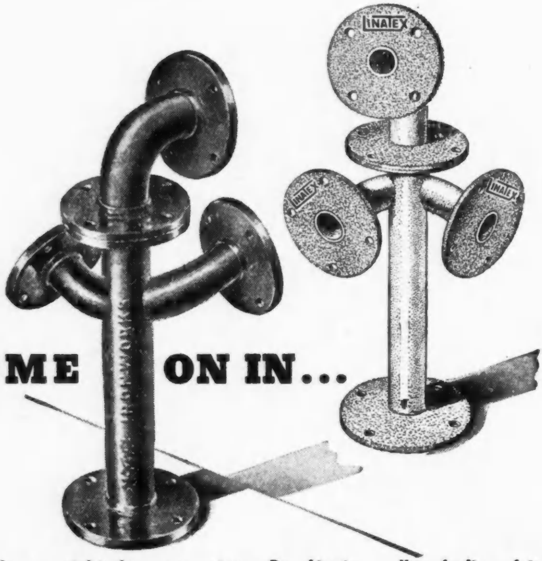
The CHEMICAL AGE

OL LX 28 MAY 1949 No. 1559

INDEX TO ADVERTISERS
IN THIS ISSUE

WILKINSON PRODUCT Making Rubber Serve Industry



'COME ON IN...

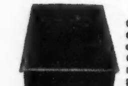
. . . you're a sight for sore pipes, Dr. Linatex. I'm feeling fair worn out!"

" Your trouble's ACIDOSIS, my boy. Let's get together and we can soon cure that."

Pipelines are the arteries of industry . . . vital factors in the production drive . . . especially where acids and corrosive liquids have to be conveyed. Valuable time is wasted, labour costs are raised and bottlenecks created by the routine replacing of worn-out pipes. Pipes that are written off to 'fair wear and tear'. Yet surely such rigorous service can only be called fair wear if the pipe is given a fair chance . . . given a lining to resist corrosion and abrasion . . . given a lining that will *last . . . given a lining of LINATEX.*

Linatex is 95% pure rubber, and its strength and resilience have been proven in countless fields of industry. The resistant properties are supreme wherever abrasive and corrosive materials are handled. Linatex linings are economical too, and conversion of existing plant can, if necessary, be carried out on site.

For storing or for conveying acids, sea-water, gases, grit, gravel, rock, grain, etc., whatever the purpose of pipe or tank . . . there is no fitter lining than LINATEX.



Large Chemical Tank protected with Linatex Lining.

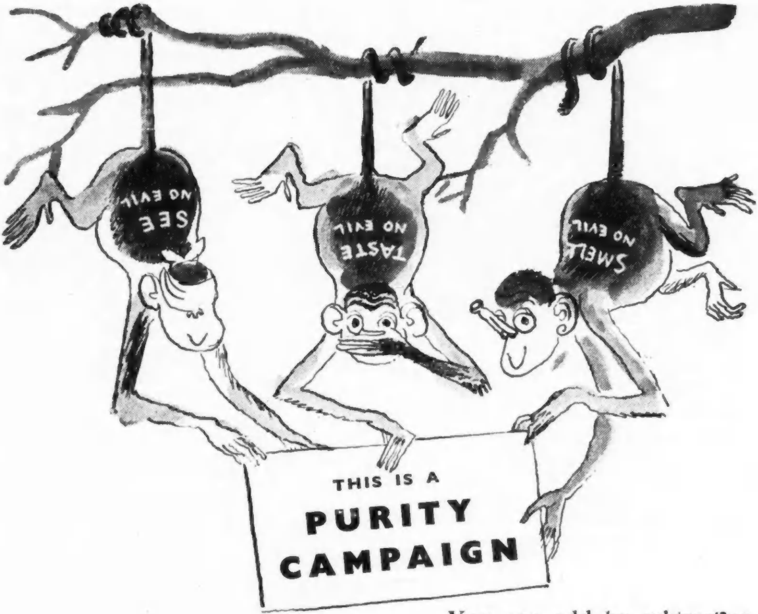
● Linatex is 95% pure natural rubber. ● Retains permanently the natural cell structure of the living rubber. ● Made entirely without heat or mastication. ● Withstands dry temperature extremes of –60° C. to 66° C. ● Can be permanently cemented to itself and other surfaces.

for pipe and tank linings . . .

WILKINSON RUBBER LINATEX LTD · FRIMLEY ROAD · CAMBERLEY · SURREY

Tel. Camberly 1595. Also in Canada, Australia, South Africa, U.S.A., Belgium, Holland, Scandinavia, Malaya, etc.

Also makers of Flexatex Hose, Linatex Ball Mill and the Linatex Pump



You can add by subtracting which isn't so upside down as it sounds. By taking away an unpleasant odour, or removing a too-insistent flavour, or purifying a muddy colour, Active Carbon adds to the attractiveness of many products. And it does these things without affecting natural values in the least. Many manufacturers already depend on it for purity but its talents are far from fully exploited and the Active Carbon specialists are always ready to look at new problems from every angle.

SUTCLIFFE SPEAKMAN

SUTCLIFFE SPEAKMAN AND COMPANY LIMITED, LEIGH, LANCASHIRE

Telephone: Leigh 94
London Office: Godliman House, Godliman Street, London, E.C.4
Telephone: City **2810**

pH measurement NEW STYLE

PORTABLE *p*H METER, TF889

*p*H measurement is now easier than ever. This new-style *p*H Meter, an addition to our range, is the handiest yet designed for routine testing. It is *truly* portable—weighs only 8 lbs.—and is direct-reading over the range 1-11 *p*H. It discriminates to 0.05*p*H and can be used anywhere at a moment's notice. It is battery-operated and self-contained. The electrode system is ingeniously protected and stowed, the carrying handle adjustable to give support at a convenient angle. Priced to suit the smaller firm and permit the larger to employ whole batteries of *p*H Meters as "inspection tools."

Full particulars from

MARCONI INSTRUMENTS LTD

MEASUREMENT FOR INDUSTRY. ST. ALBANS, HERTS. Telephone: St. Albans 6161/5

Northern Office: 30 ALBION ST., HULL. Western Office: 10 PORTVIEW RD., AVONMOUTH. Southern Office & Showrooms: 109 EATON SQ., LONDON, S.W.1. Midland Office: 19 THE PARADE, LEAMINGTON SPA.

---

40 years' experience enables us to supply

BELTING

and

ENDLESS VEE ROPES

of

Superlative Quality

LARGE STOCKS ... PROMPT DISPATCH

FRANCIS W. HARRIS & Co. Ltd.

BURSLEM-Stoke-on-Trent

Phone: Stoke-on-Trent 87181-2

Wires: Belting, Burslem

The Chemical Age

A Weekly Journal Devoted to Industrial and Engineering Chemistry

BOUVERIE HOUSE, 154 FLEET STREET, LONDON, E.C.4

Telegrams: ALLANGAS FLEET LONDON — Telephone: CENTRAL 3212 (20 lines)

SCOTTISH OFFICE: 116 Hope Street, Glasgow (Central 3970)

MIDLANDS OFFICE: Daimler House, Paradise Street, Birmingham (Midland 0784-5)

THE CHEMICAL AGE offices are closed on Saturdays in accordance with the adoption of the five-day week by Benn Brothers, Limited

VOL. LX No. 1559 — 28 May 1949 — Annual Subscription 30s. 8d. per copy, post paid, 10d.

Untapped Coal Reserves

IT is characteristic of the prevalent short-term outlook on many current affairs, even in some sectors of industry, that the news that the existence has been established in Staffordshire of a great new addition to known reserves of coal has received only passing notice. The scant attention given to this, in comparison with the longer detailed accounts of many events of an ephemeral sort, must for many have disguised the fact that a discovery of that order can in the long run be much more productive of good in the country's uphill and possibly long journey back to stable living conditions than many more publicised events such as, for example, the location of problematical supplies of uranium-bearing material. No doubts on that score, however, will exist in the minds of those directing the heavy sections of chemical industry. To those sections an enlargement of prospective coal supplies is in effect an assurance of a new lease of life, when at some problematical date in the future existing mines from which chemical industries have for generations drawn rich supplies of chemical material, as well as the energy to extract, distill and process them, are no longer able to maintain the accustomed output. That is in many cases fortunately still a fairly remote prospect, but its inevitability is disclosed by the occasional publication even now of "obituary" notices concerning pits which have passed the stage at which coal raising can be profitably continued. A recent example in Lanarkshire lends point to that warning.

Those are some of the reasons which would justify the award of special distinction to the Geological Survey of Great Britain for its predominating part in the long search which has been rewarded by the discovery at Whittington Heath, near Lichfield, Staffordshire, of accessible coal deposits which at the most conservative estimate could provide the equivalent of nearly two years' output of all deep mined coal in Great Britain. The provisional estimate indicates that there are here not less than 400 million tons of workable coal of good quality lying in seams five, six and eight feet thick at around 3000 feet, and does not take account of the existence of other smaller occurrences of which borings have provided evidence. Many years have elapsed since a "strike" of comparable importance was recorded and in this instance all the geological indications point to the probability that the reappearance to the East of the formation upon which the prosperity of the great Cannock Chase coalfield was founded may be as fruitful as when it was first uncovered.

The Department of Scientific and Industrial Research, which is responsible for the Geological Survey organisation, will probably not have erred towards over optimism in forecasting that the new seams should rejuvenate this coal area, permitting at least another 80 years of productive coal-getting. Thanks to the

B

On Other Pages

advance in deep mining technique there is now no reason why whatever lies beneath the first substantial strike at 3000 feet should not ultimately go to swell the total of the new coal reserve. In 400 ft. below the first substantial seam the survey team reports that about 30 ft. of coal was in evidence. The bores are now being sunk to 4000 ft. and the experts have admitted that there may well be as much as 2000 million tons lying under this part of Staffordshire, and nearly all of it in open country where no serious impediment to mining should exist.

All these facts and speculations, pointing to what might be regarded as a windfall—as opposed to the shortfall which has become familiar in some other industrial affairs, pay little regard to the antecedents of the present discovery. While the immediate credit belongs to the Geological Survey and secondly to the Government, which had the wisdom two years ago to provide it with special funds for the purpose, the prospect of a fresh coal source here was recognised over 60 years ago. It was in fact predicted in precise terms in the course of a survey which Mr. W. Fairley, a mining engineer in Gentleshaw, produced in 1886, who named Whittington Heath as one of the most propitious locations for a colliery. Scientific study of the factors fully confirmed that prediction, indicating that coal would recur, at greater depth, beyond the fault which terminates on the East the Cannock Chase measures. By vindicating the effectiveness of the scientific method the present evidence encourages hopes that by the same means other new mineral wealth, not merely coal, may be added to the total resources of Britain. Few enterprises at present are more deserving of financial and all other encouragement. The delay in exploiting coal, the existence of which could be confidently predicted before most of the present survey team were born, is not peculiar to this one section of mineral affairs. It is in a sense a stimulating reflection that there remain neglected in many parts of the country other mineral beds from which by improved technology valuable yields of such things as barium chemicals, pyrites and possibly montan wax could be won. All such reserves are of paramount importance to chemical industry and call for long preparation before a return can be secured. The expert view that five years may elapse before the coal is raised at Whittington Heath forcibly underlines the urgent need of speeding now all practicable surveys of other sources of mineral wealth.

NOTES AND COMMENTS

April Trade

THE steady level maintained by United Kingdom chemical trading in April, when overseas sales of many other key products were far less buoyant than of late, happily lulls some of the apprehensions to which the rising scale of chemical production in Europe and the "backward" countries and the heightening of some import barriers had given rise. The pruning by **£245,266** of the April total of **£3.6** millions for "chemical manufactures" in comparison with April last year is very much less drastic than the restriction seen, for example, in the values represented by some textile exports. When allowance is made for the slackened pace following the Easter holiday, the grand total for "chemicals, drugs, dyes and colours" of **£6,891,439** in April, only some **£11,000** less than in 1948, will be seen as a very encouraging confirmation of the effectiveness of recent enlargement of productive capacity in the sectors in which world requirements have never been fully supplied since the war.

Plant *v.* Chemicals

IN the delicate operation of apportioning chemical intermediates between needy industries here and overseas the allocation of a very much larger portion for shipment, which I.C.I., Ltd., and some others are recorded to have done in special categories, begins to appear as a diplomatic necessity. The reaction to continued scarcity conditions in the buying countries, now being offered much freer conditions for acquiring chemical plant, is not hard to foresee. While no conclusion can safely be reached on the evidence of one month's export figures, the big rise in the value of foreign sales of gas and chemical machinery in April (**£394,183** against **£113,301** a year ago) corresponds very closely with the trend recorded in the four months of this year. The appropriate moment has arrived to direct attention again to one important aspect of the last report of the British Chemical Plant Manufacturers' Association. It recorded: "The association was able to persuade the Government that it would best serve the national interest if it employed its main resources to equip the home chemical and allied industries to enable them to fulfil their onerous and important export targets rather than to export too much chemical plant and so build up overseas chemical industries to compete with our own." That persuasion seems now to need renewal.

Recession in France

OF considerable assistance in forming a balanced view of some of the difficulties and hazards apparent in the current affairs of chemical industries, here is a brief study of the problems facing some of their counterparts overseas. In France, for example, the slackening in the post-war requests for almost all kinds of chemical products has reached a stage which makes our own experience of the phenomenon seem almost trivial. Already the sector of chemical industry associated with agriculture has sustained a reduction in turnover; orders are dropping off, hours of work being reduced and stocks are growing. In many branches the French industry is at a disadvantage as an exporter, because it pays for coal much more even than the inflated British price and correspondingly more than the American, while electricity restrictions and shortage of supplies of copper and zinc, due to lack of foreign currency, have further complicated the issue. France's important perfume industry has been seriously hit by lack of purchasing power at home and import restrictions in most countries. Out of 4000 manufacturers existing at the liberation, over three-quarters are believed to be out of business. The taxation bugbear is very familiar: for a litre bottle of Eau-de-Cologne, over 400 francs is exacted in taxes. Certain producers have been seeking to manufacture abroad. This in turn has reacted unfavourably on the glass and packing industry.

Invasion of Industry

THE ending of the "non-aggression" principle, which seems to have deterred many from speaking their minds about the implications of the increasingly deep incursions by the Government into the affairs of industry and commerce, has been signalised this week by several

weighty attacks, of which that in the House of Lords upon some hollow arguments on behalf of steel nationalisation have disclosed issues not peculiar only to iron and steel. The same unpromising policies in another sphere were the theme of a lively, caustic commentary by Mr. L. D. Gammans, MP, before the British Chemical and Dyestuffs Traders' Association at their lunch in London this week. He deplored, with most of them, the emphasis on politics as the determinant of nearly all current affairs, recalling that it had shifted the centre of gravity in economic matters from the City of London to the floor of the House of Commons. One of the most robust adversaries of current plans to corner increasingly wide fields of initiative, he revealed himself as something of a recruiting sergeant in the association's interest, advocating the pressing need at the moment of full membership and unreserved support for trade associations such as theirs which retained their independence. Such organisations, he reminded them, had become their only remaining weapon.

New Research Centre

A REMINDER of how continuous are the demands for further research made upon the more enterprising sections of the chemical industry enjoying a prosperity founded upon successful investigation in the past was implicit in the opening at Ruabon last week of the new research centre of Monsanto Chemicals, Ltd. Viewing the long list of specialised chemicals for rubber, lubricants and pharmaceuticals alone forming a part of the studies at Ruabon, it might well be thought that the wealth of research which has already been given to their production would have sufficed for a long time to come. However, the truth that industrial chemicals, with very few exceptions, seldom cease to change their shape and potentialities unless they have been superseded and are virtually dead is keenly appreciated here, and the policy of critically examining all products, regardless of their apparent adequacy by current industrial standards, is probably the best way of ensuring that the schedule of products will continue to lengthen and that none of its items will become obsolete. The predominating characteristic which makes this and some other industrial laboratories such direct benefactors of the production drive is the large proportion of all the work done which is devoted to the special problems submitted by the user industries. Important changes in the structure of many chemical intermediates and the genesis of important new materials have frequently come from that very practical kind of collaboration. Sir Ben Lockspeiser, secretary of the DSIR—who formally opened the new building at Ruabon with a golden key—described the undertaking as an act of faith: in this country, in the potentialities of science, and in the young people who would help to hold for Britain her place in the world.

Bulk Purchasing

Chemical and Metal Totals in 1948

IN reply to a question by Mr. L. D. Gammans in the House of Commons this week about the quantity and value of goods bought in bulk from overseas by Government departments during 1948, Mr. Bottomley, Parliamentary Secretary for Overseas Trade, gave the following particulars, among others: Materials for fertilisers and for the manufacture of sulphuric acid, quantity purchased 2,104,560 tons, value (f.o.b.) £11,328,000; chemicals, quantity purchased, 602,121 tons, value (f.o.b.) £7,997,000.

Mr. Bottomley also gave particulars of purchases of various ferrous and non-ferrous metals, which included: steel, 374,634 tons, value (f.o.b.) £10,234,324; zinc, 158,342 tons, value (f.o.b.) £10,466,000; chrome ore, 113,500 tons, value (f.o.b.) £528,000; copper (blister and electrolytic) 312,500 tons (excluding some tonnages returned from toll refining overseas), value £37,278,000.

(*Continued at foot of next column*)

Alcohol and Solvents Freed

Ten Years' Government Control Ended

THE Board of Trade announced on Tuesday that the Molasses Order (1949) has been made, releasing industrial (ethyl) alcohol, butyl alcohol, acetic acid and acetic anhydride from control on June 1, 1949.

These products, which have a wide use throughout industry, have been subject to controls since September 1939, and to Government-ownership for the greater part of the time since then. In effect, the Government took over the industrial distilling industry in October 1941. The ending of control permits reversion to private trade.

NEW SCOPE FOR MONSANTO RESEARCH

Wide Objectives of Model Laboratories at Ruabon

EQUIPMENT to produce important contributions to the fund of scientific and technical material jointly used by this country and the U.S.A. was completed at Ruabon on May 20, when Sir Ben Lockspeiser, secretary of the Department of Scientific and Industrial Research formally opened the Nickell research laboratories of Monsanto Chemicals, Ltd.

This aspect of the new addition to Monsanto's equipment for research was made clear by Dr. W. D. Scott, director of research, speaking at a dinner given in Chester the same evening to celebrate the event. He indicated that a new recognition of the value of European research contributions had grown up in America during the war. Such discoveries had sustained many developments in the U.S.A.

To Export Ideas

Now the American associates of Monsanto were urging them to undertake research on a wider basis than was required by direct needs here, so that they should be able to export developed and undeveloped ideas. They would be able thus "to make the best of both worlds."

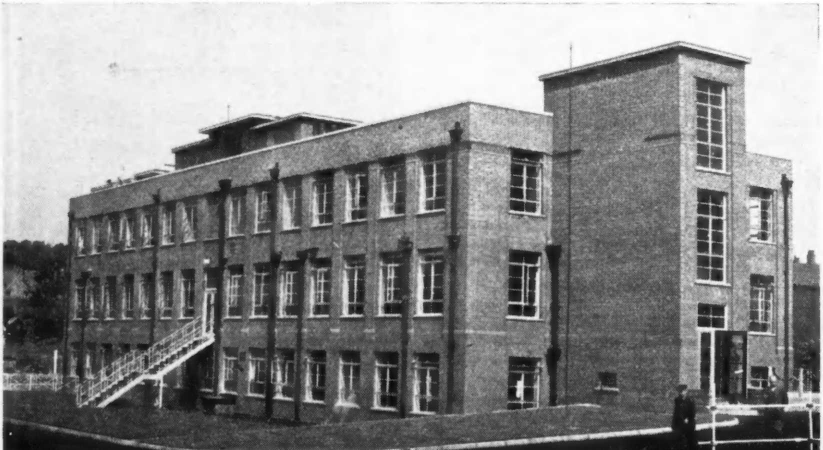
The new laboratories, which commemorate the fruitful direction of the company by Dr. Lloyd Francis Nickell, whose service as chairman and managing director from 1930 until his retirement last year is recalled by a plaque in the vestibule, are an extremely good example of the provision in one well designed centre of all the essential needs for wide ranging research and industrial investigations in the fields of physics and chemistry.

Effective Plan

Its architecture is likely to be of great interest to many who at this time are contemplating or undertaking building for similar reasons. The building, in the centre of the Ruabon estate and having at its rear a large area for further growth, is of the convenient and agreeable plan generally adopted now. It comprises, on three floors and a basement, two large wings connected by a smaller building in which are located all the separate departments which do not require large floor space, including the offices, a well equipped library and a conference room.

In the two wings are the larger laboratories, five in number, on the ground and the first floors, provided with full laboratory services and ample natural lighting. These, and all the other workplaces are also good examples of effective artificial lighting, provided by an elaboration of the fluorescent system giving exactly the same intensity in all parts of the room.

Although all the emphasis is upon pro-



The new research block

At the opening ceremony (left to right) Mr. T. P. Berrington, Dr. W. D. Scott, and Sir Ben Lockspeiser

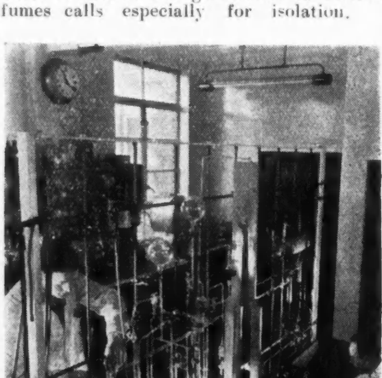
viding everything likely to promote accurate, unimpeded work, some useful economies have been effected by far-seeing architectural design. By considering and inter-relating a number of factors such as the shape and positioning of the several sections and their heating-ventilation equipment, it has been possible to dispense with air-conditioning, which is almost invariably included in contemporary American laboratories and adds substantially to the initial cost and subsequent operating charges. The effectiveness of the present principle is shown by the fact that few of the rooms depend on mechanical ventilation. The use of fans is confined very largely to the fume cupboards, each with its independent acid-resisting duct.

The location of the laboratory in the midst of Monsanto's large producing plant has facilitated some other economies, such as "free" supplies of steam, water and electricity; space heating, however, is an independent supply derived from steam-to-water calorifiers in the basement, and transmitted by a low temperature water system concealed between floors and ceilings. This combines with an advanced system of structural insulation, using cork covered with asphalt on the roofs and continuous cavity partition and exterior walls, to make laboratory work more or less unaffected by the fluctuation of outdoor temperature.

Full use has been made of the functional opportunities in architecture. The main piers, forming with the steel framework the skeleton of the block, serve as ducts carrying the services which are distributed under the floors and are easily accessible. There are no overhead services to restrict the height of assemblies or freedom of movement in the laboratories.

In the bench layout sinks have been substantially dispensed with by laying along the back of the bench deep, open channels, to save both space and much unproductive movement by those working there. All the services are immediately "on tap," gas, steam, compressed air or vacuum, standard and low-voltage electricity, hot and constant-pressure cold water, etc., come vertically to central points in the bench, with easily accessible grouped controls.

The building plan incorporated a basement and a flat roof and both serve useful functions. The merits of a basement section have been exploited by locating there the workshop services including, in addition to the glass working section, the full complement of metal working machines requiring solid foundations. Another very practical use of the underground rooms, in addition to accommodating all stores, is the construction there of a refrigerated laboratory. Stable temperature is, of course, very much more easily maintained here. On the flat roof is placed a pent-house which affords very useful facilities for any experimental work in which the generation of noxious fumes calls especially for isolation.



This view, in Dr. Roebuck's laboratory, reveals the good conditions of full lighting and ample space facilitating the use of large glass assemblies

THE VALUE OF RESEARCH

Sir Ian Heilbron and the Brewers' New Centre

"IF anyone present here this evening had any lingering doubts about the value of research and of its immense practical applicability they would surely have been dispelled by a visit to the British Industries Fair," said Sir Ian Heilbron, president of the Chemical Society and director of the Institute of Brewing Research Foundation, replying to the toast of "Research" at the institute's dinner in London last week. "Here, to quote only one example, one saw a bewildering display of plastic articles extending into almost every avenue of our civilised life. All these have sprung from research, which only a decade ago had not emerged from the academic phase. Britain must ensure that it retains its position in the forefront of research if we are to maintain and enhance the standard of living of our people."

Despite the fact that all the processes involved in malting and brewing were based upon biological and other phenomena which were, and had been for a long time, amenable to scientific interpretation, there was a surprising absence of fundamental knowledge. This must be remedied if the brewing industry was to reach its full stature which, he suggested, implied more than providing a traditional British beverage. He had in mind the amazing expansion of the fermentation industry, as illustrated by the production of antibiotics such as penicillin, streptomycin, of vitamins, and of many other complex compounds elaborated in the living cell during fermentation.

Vision

In launching the present scheme, for the setting up of a brewing research centre at Lyttel Hall, Nutfield, Surrey, the brewing industry showed its vision and faith. From now onwards it ranged itself alongside so many other great industries in this country in its determination to carry out co-ordinated research for its corporate good. Speaking as president of the Chemical Society, he could say that the chemical community viewed this development as a happy omen and one fraught with glowing possibilities.

His earliest contact with brewing dated back some forty years when, as secretary of the students' chemical society in what was then the Glasgow and West of Scotland Technical College, it fell upon him to arrange suitable works visits. He quickly found that the most popular of all were those to the local breweries, back to his mind the verse :—

"Hurrah for the brewery visit
And beer in liberal doses !
In the cause of science, what is it
But inspecting a technical process?"

Reviewing the progress made in reconstructing the Institute of Brewing research organisation, Sir Ian Heilbron noted a somewhat similar development in America, where the Master Brewers' Association was instituting a research foundation. He envisaged their research foundation as the scientific nerve centre for their great industry. It would, on the one hand, teach them how to apply such fundamental knowledge as they already possessed. On the other hand, by its own efforts, by supporting extra-mural work, by scientific intercourse, by every reasonable means it would add to that fundamental knowledge which, in an empirical art like brewing, was at present so scanty but which, just because of this empiricism, was so much more necessary.

University Status ?

Could they not envisage a brewing centre of university status arising from which would flow a supply of trained biologists both for the industry itself and for ancillary organisations? At the same time he appreciated that there existed many problems in their great industry which could be solved on the basis of existing knowledge. Here the provision of applied laboratories equipped to deal with analytical, biological and other matters, including an experimental brewery, and forming an integral part, both geographically and in principle of their central research institute, was in the forefront of his plans.

They could not, however, hope for major advances unless they had real knowledge of all the materials and processes which went to make up malting and brewing. Accordingly, even in these comparatively early days of reconstruction, they had, guided by the principles laid down in the Institute of Brewing's research scheme, thought fit to spread their net widely.

Of their specialist scientific staff, which was to number about twenty-five at the beginning—though their laboratories would be adequate for a large number—some eighteen members had been appointed or were in course of appointment, some already working extra-murally in the universities. He felt that he could assert that a research foundation was arising which in every way would be commensurate with the importance of the industry.

OFFICIAL TESTS OF AMMONIUM NITRATE

Marked Explosion Resistance of British Grade

CONSEQUENT upon the disasters at Texas City and Brest, when ships loaded with American fertiliser grade ammonium nitrate caught fire and exploded, the Home Secretary ordered an inquiry into the possible hazards if ammonium nitrate manufactured in this country became involved in a fire. To this end a working party was set up under the chairmanship of H.M. Chief Inspector of Explosives. A series of experimental investigations has been carried out in the Armament Research Establishment at Woolwich and Shoeburyness and on the Island of Dune, off Heligoland (THE CHEMICAL AGE, 59, 679). The following report by Mr. W. A. Bailey, of the Armaments Research Department of the Ministry of Supply, is an account of this work and the conclusions to be drawn from it.

British and American Compared

It is first noted in this report that the material which exploded at Texas and Brest consisted of ammonium nitrate specially treated for use in agriculture. Ammonium nitrate cakes into a relatively solid mass very soon after manufacture, and in order to keep it in a free-flowing condition the American product is coated with about 1.0 per cent of a hydrocarbon of the vaseline type and about 5 per cent of koalin. It is packed in six-ply paper bags, two of the layers being treated with an asphaltic compound. Each bag contains 100 lb. of the salt.

British material which is being used in agriculture is pure ammonium nitrate packed in steel drums each containing 4 cwt. Sometimes the drums are lined with waxed paper before filling. The ammonium nitrate is prepared synthetically and is of a high order of purity. It contains 99.8 per cent ammonium nitrate, about 0.15 per cent water and traces of impurities.

It is known that ammonium nitrate may be exploded if powerfully initiated by an explosive. It is more readily exploded if it is mixed with oxidisable materials. Other impurities such as chlorides and some metallic dusts adversely affect its stability. As the Texas City and Brest distasters appeared to be due solely to thermal effects, it was decided to study the differences in behaviour when the British and American materials are subjected to heat.

For experimental purposes a mixture similar to the American product was prepared as follows :—

Pure ammonium nitrate was dried and passed through a 36 BS sieve. The sieved nitrate was placed in a steam-heated pan, and 1 per cent of mineral jelly dissolved in carbon tetrachloride was added slowly with stirring. The amount of carbon tetrachloride used was just sufficient to wet all the nitrate. The nitrate was heated, with continuous stirring, until all carbon tetrachloride was removed. The dried material was spread out, and 4 per cent of kaolin intimately mixed in. This mixture was referred to as AA/N. The commercial British product was designated BA/N.

In the first place a few standard tests were applied. The sensitivity to impact of the two materials was examined and AA/N found to be little more sensitive than BA/N. On the vacuum stability test no significant difference at 120°C. and 160°C. could be established between the two. When a layer of BA/N contained in a steel trough is heated at one end by means of a Bunsen burner, it melts, froths and eventually catches fire. On removal of the burner the burning soon ceases. AA/N behaves similarly but takes fire somewhat more reluctantly, the koalin acting as a sort of blanket to the fire.

Thermal Tests

Some simple experiments were then carried out in the laboratory.

(1) A small quantity of BA/N was heated from room temperature on a thin sheet-iron plate over a Bunsen burner. It melted and decomposed with evolution of copious white fumes, and when the iron plate was at dull red heat it caught fire and burnt away quietly with an orange flame. AA/N behaved similarly except that the decomposition was delayed for a few seconds and the fire was somewhat more vigorous and the flame brighter.

(2) In another experiment the two materials were dropped on to the steel plate which had been heated to a dull red heat. BA/N quickly caught fire and burned away quietly. AA/N took a little longer time to catch fire and then burned with vigour. It was interesting to note than an inert mass, presumably the kaolin, floated in the middle of the decomposing nitrate and the fire was all around the edge of this mass, which acted as a sort of incombustible umbrella.

(3) In another series of experiments about 0.1 gram of either BA/N or AA/N was introduced into a small test-tube and the open end drawn off into a fine capillary

about 0.1 mm. diameter. The tube was placed in a shallow recess in a red hot steel plate which was heated over a Bunsen burner. Under these conditions BA/N melted and gave off white fumes which escaped through the capillary. When practically all the nitrate had gone and only a white deposit was left brown fumes were seen and a flash occurred within the tube. AA/N melted and frothed and very soon ignited and gave off brown fumes which escaped through the capillary.

Similar tubes were filled but the capillaries were drawn off and sealed. When placed on a red hot plate BA/N first gave off white fumes followed by brown and then exploded, shattering the tube. With AA/N burning commenced in the tube very quickly, brown fumes were given off and an explosion followed.

The significant difference in the results is that AA/N quickly gives off brown fumes when heated while BA/N gives off white. The suggestion is that the former is less stable than the latter, as it reached the stage of more vigorous decomposition more rapidly.

(4) The results obtained in (3) indicated that if confined and heated either AA/N or BA/N may explode. In order to determine whether such an explosion would propagate through a column of the nitrate the following experiments were carried out. Hard glass tubes $\frac{1}{4}$ in. bore and 30 in. long were sealed at one end and filled with the two materials. The closed end was supported in a recess on an iron plate and heated by means of a Bunsen burner. In both cases explosions occurred in from one to two minutes but did not propagate along the tube.

In Glass and Drums

In the next experiments a cylindrical glass bulb about 3 in. long and $\frac{3}{4}$ in. internal diameter was fused on to a length of glass tubing 24 in. long and $\frac{1}{4}$ in. bore and filled with the two materials. The bulb was heated as before. Explosions occurred with both materials but did not propagate along the tube.

Other experiments were carried out in which BA/N and mixtures of BA/N and oxidisable materials were subjected to sudden intense heating. Tin boxes 2 in. diameter by 2 in. long were filled with the mixtures and cooked off by means of thermit. In every case the mixtures burnt away and no explosion occurred (*see* table No. 1). In a larger scale trial a steel drum containing 4 cwt. BA/N was supported on house bricks and a flat tin containing 26 lb. thermit placed immediately underneath it. On igniting the thermit the bottom of the drum was incinerated and much brown smoke was produced for about 2 min. The brown smoke then ceased and white smoke was given off for about 10 min. About a quarter of the nitrate was consumed but no explosion occurred.

TABLE 1

HEATING AMMONIUM NITRATE WITH THERMIT

Contents of Box	Position of Thermit	Result
Pure ammonium nitrate	Top of box	Nitrate burnt away
,, ,, ,,	Under box	
,, ,, ,,	Surrounding box	
,, ,, ,,	In contact with nitrate	
Pure ammonium nitrate +10% mineral jelly	Top of box	Nitrate burnt away. Slight deflagration
Pure ammonium nitrate +10% linseed oil	Top of box	
Pure ammonium nitrate +10% slag	Top of box	
Pure ammonium nitrate +5% linseed oil	Surrounding box	Nitrate burnt away
Pure ammonium nitrate +5% mineral jelly	Surrounding box	
Pure ammonium nitrate +1% mineral jelly +4% kaolin (Equivalent to AA/N)	Top of box Under box Surrounding box	

As the probability of explosion occurring appears to be influenced by the degree of confinement of the system it was decided to continue the work using shell HE 2 pdr. MK II T which could be filled and plugged with steel plugs. They were heated electrically by a coil of resistance wire wound on the outside. Preliminary experiments indicated that BA/N decomposes at a slower rate than AA/N and develops less violence.

The conditions were then standardised as follows. Each shell was filled with 60 gm. of material and plugged with steel nose and base plugs using sodium silicate/asbestos cement on the threads. To prevent the plugs blowing out under simple gas pressure they were clamped in position. The outside of the shell was wrapped with asbestos paper and a closely wound coil of 8 yards of 26-gauge nichrome resistance wire was fitted. A current of about 5 amps at 250 volts was passed and the time for the shell to burst noted. The quality of the burst was also assessed (*see* table No. 2).

The BA/N filled shell split open on one side only from the nose to just above the driving band. The nose plug was ejected but the base plug was still in position. The AA/N filled shell split throughout its length on one side and was split and torn in several places elsewhere. Both plugs were ejected.

The general picture is that the AA/N filled shell exploded in a shorter time than the BA/N and showed more violent effects. On the average the AA/N shell exploded after 195 sec. when the wall temperature was estimated to be about 290°C. and the BA/N shell exploded after 237 sec., when

the wall temperature was estimated to be about 340°C.

In order to study the effects produced when the two materials were less heavily confined another series of experiments was carried out using bomb exploder containers. These are drawn steel tubes 7.7in. long, 1.27 in. internal diameter and 1.44 in. external diameter fitted with a screwed ring at the open end. They were filled, closed with a steel plug and wired externally for electrical heating with 7 yd. of 26-gauge nichrome resistance wire.

A current of 5.5 amps at 250 volts was passed and the time to burst and quality of burst noted.

Times and Temperatures

The BA/N filled containers behaved similarly to the 2 pdr. shell but, as would be expected, were opened to a greater degree. The AA/N filled containers suffered greater damage. They were torn considerably and distorted. On the average the AA/N container exploded after 107 sec. when the wall temperature was estimated to be about 277°C. and the BA/N container exploded after 145 sec., when the wall temperature was estimated to be about 330°C.

In a further trial to study the effect of heating a larger mass of material in a well confined system, two shell HE 5.5 in. were filled, one with AA/N and one with BA/N and fitted with steel plugs cemented in with sodium silicate/asbestos cement. Each shell was laid on the ground over a cannister filled with RDX/TNT, which was ignited by remote control. The conditions were standardised as far as possible and both cannisters lit up at the same time and burned with the same vigour. In 4 min. the shell containing AA/N exploded violently and one piece of shell about 6 in. by 4 in. was found 65 ft. away in an equatorial plane. The shell containing BA/N exploded mildly in 5½ min. and was projected undamaged 140 ft. in the line of its axis, the plug being missing.

The inference here is that in AA/N filled shell the decomposition was rapid and accelerative, becoming explosive in character, while the BA/N shell was subjected to a slowly developed internal pressure which ultimately blew out the plug.

This result suggested that controlled trials in shell larger than the 2 pdr. would be profitable. It was thought that information would be obtained if shell filled AA/N and BA/N were heated locally and the time to explode and the nature of the explosion observed. Shell HE 5.5 in. were first used. They were filled with the two materials and into the noses were screwed a/c bomb exploder containers and heating units.

Each shell contained about 8 lb. of nitrate. The shells were rested on sandbags, nose downwards at an angle of 30° to the horizontal. An electric current was passed. The shell containing BA/N did not explode although the power input was increased from 1 to 3 kW, whereas the AA/N shell exploded every time, using only 1 kW.

It was stated in the introduction that some drums filled with BA/N are lined with waxed paper before filling. As the presence of this liner may conceivably affect the stability of the nitrate if heated, the following trial was carried out in the same type of shell to see whether different effects were produced from those obtained with the BA/N filled shell.

Two exploder containers were insertel into waxed paper thimbles and assembled to two shells containing BA/N and electrical heating units inserted. A current of 7 amps at 280 volts was passed. In one case the shell leaked after 5½ min. but was undamaged. In the other, the container with the electrical unit was ejected from the shell after 7½ min. The shell was projected for about 50 yd. It still contained ammonium nitrate and was undamaged.

The trials were continued with shell 15 in. HE. The shell filled BA/N did not explode when heated for 20 min. at 5 amps and 220 volts followed by 15 min. at 7 amps and 295 volts and then 4½ min. at 8 amps and 330 volts, representing an energy expenditure of 1080 watt-hours, when the electrical unit burnt out.

Contrasting Results

A new unit was inserted after the shell had cooled and heated for 15 min. at 7 amps and 320 volts followed by 25 min. at 8 amps and 340 volts, or a further energy expenditure of 1690 watt-hours. No explosion occurred. The shell filled AA/N exploded after 20 min. at 5 amps and 220 volts followed by 5 min. at 7 amps and 315 volts, i.e., after an energy expenditure of only 550 watt-hours. The explosion was very violent and the shell well fragmented. The nose only of the BA/N shell was hot after the trials, the main body being cold, which shows that in the AA/N shell propagation proceeded through the cold mass.

Other experiments were carried out in cold-drawn steel tubes 2 ft. long, internal diameter 0.45 in., thickness 0.08 in. They were filled with AA/N and BA/N and closed. The AA/N tubes were opened up along practically the whole of their length, showing that the decomposition was explosive in character and propagated along the length. The BA/N filled tubes opened up in the heated region only, the rest of the tube remaining intact.

(*To be continued*)

SMALL REDUCTIONS IN EXPORTS

Several Individual Items Show Improvements

THE total value of British chemical manufactures, excluding drugs and dyestuffs, exported in April, £3,614,873, was £245,266 less than the figure in April, 1948 (£3,860,139). Notable decreases included these: sulphate of alumina 2700 tons against 3477 tons in the corresponding month of last year; ammonium sulphate 5316 tons, compared with 11,045 tons; bleaching powder 40,880 cwt. (47,865 cwt.); cresylic acid 73,168 gal. (239,637 gal.); fertilisers 604 tons (3595 tons); disinfectants, insecticides, etc., 51,255 cwt. (61,225 cwt.); collodion cotton 1709 cwt. (3814 cwt.); potassium compounds 6435 cwt. (9198 cwt.); lead acetate, litharge, red lead, etc., 3432 cwt. (11,028 cwt.); sodium carbonate 300,275 cwt. (530,600 cwt.); caustic soda 103,148 cwt. (203,966 cwt.). Salt exports showed an increase from 12,216 tons in April, 1948, to 14,474 tons. Sodium sulphate rose from 38,236 cwt. in April last year to 82,342 cwt. Sodium silicate exports also showed a substantial increase, from 11,012 cwt. to 24,080 cwt. Copper sulphate exports were nearly three times as large as in April, 1948, 9216 tons against 3353 tons. "Gas and chemical Machinery" showed a substantial increase from 10,160 cwt. to 37,022 cwt. Comparative figures are shown below.

CHEMICAL EXPORTS

	April, 1949	April, 1948
	Cwt.	Cwt.
Formic acid	2,878	2,316
	Lb.	Lb.
Salicylic acid and salicylates ...	131,031	171,483
Value of all other sorts of acid ...	£94,921	£64,954
	Tons	Tons
Aluminium oxide	—	54
Sulphate of alumina	2,700	3,477
All other sorts of aluminium compounds	336	405
Ammonium sulphate	5,316	11,045
Ammonium nitrate	6,763	7,420
All other sorts of ammonium compounds	1,737	2,042
	Cwt.	Cwt.
Bleaching powder	40,880	47,865
All other bleaching materials ...	7,848	6,497
	Gal.	Gal.
Cresylic acid	73,168	239,637
Tar oil creosote oil, anthracene oil, etc.	2,299,784	1,866,737
Value of all other sorts of tar oil ...	£45,055	£23,817
	Cwt.	Cwt.
Collodion cotton	1,709	3,814
	Tons	Tons
Copper sulphate	9,216	3,353
	Cwt.	Cwt.
Disinfectants, insecticides, etc. ...	51,255	61,225
	Tons	Tons
Fertilisers	604	3,595
	Cwt.	Cwt.
Nickel salts	4,078	5,632
Lead acetate, litharge, red lead, etc.	3,432	11,028
	Gal.	Gal.
Tetra-ethyl lead	152,217	113,280
	Tons	Tons
Magnesium compounds	905	774
	Gal.	Gal.
Methyl alcohol	12	3,429
	Cwt.	Cwt.
Potassium compounds	6,435	9,198
	Tons	Tons
Salt	14,474	12,216
	Cwt.	Cwt.
Sodium carbonate, etc.	300,275	530,600
Caustic soda	103,148	203,966
Sodium silicate	24,080	11,012
Sodium sulphate	82,342	38,236
All other sodium compounds ...	69,584	39,486
Cream of tartar	258	77
Tin oxide	303	444
	Tons	Tons
Zinc oxide	727	812

Total value of chemical manufactures, excluding drugs and dyestuffs	£3,614,873	£3,860,139
	Oz.	Oz.
Quinine and quinine salts ...	152,151	92,752
	Lb.	Lb.
Acetyl-salicylic acid	131,625	142,149
	100 International units	100 International units
Insulin	680,732	738,569
	Mega units	Mega units
Penicillin	586,729	322,693
Total value of drugs, medicines and preparations	£1,583,847	£1,181,599
Total value of dyes and dyestuffs ...	£817,017	£772,044
	Cwt.	Cwt.
Plastic materials	28,913	27,884
Value	£362,867	£333,328
	Cwt.	Cwt.
Chemical glassware	1,078	1,760
Value	£38,142	£62,621
	Cwt.	Tons
Fans	4,149	100
Value	£120,013	£84,507
	Cwt.	Tons
Furnace plant	8,730	681
Value	£125,291	£122,845
	Cwt.	Tons
Gas and chemical machinery ...	37,022	508
Value	£394,193	£113,301

CHEMICAL IMPORTS

	April, 1949	April, 1948
	Cwt.	Cwt.
Acetic acid	—	24,239
Boric acid	3,620	7,920
All other sorts	905	3,601
Borax	7,200	51,340
Calcium carbide ... ... =	—	7,183
Coal tar products, excluding benzol and cresylic acid	—	17,846
Cobalt oxides	448	429
	Tons	Tons
Arsenic	174	1,161
Fertilisers	19,415	5,344
	Lb.	Lb.
Iodine	66,050	—
	Cwt.	Cwt.
Potassium chloride	467,259	704,810
Potassium sulphate	18,500	64,500
All other potassium compounds	2,171	3,099
Sodium nitrate	80,645	39,880
All other sodium compounds ...	1,271	3,830
Carbon blacks (from natural gas)	32,591	108,263
Total value of chemicals, drugs, dyes and colours	£2,044,019	£2,475,732

World Recovery in Chemical Industry

American Survey of Eight Countries

INTENDED to be an indication of the extent of world recovery in the chemical industry, a survey has just been completed by the U.S. Department of Commerce. It states that chemical production throughout the world, although still below pre-war levels, is on the up-grade. A country-by-country report refers to the following aspects of recent development:—

UNITED KINGDOM: Phthalic anhydride supplies will continue short, and imports from the U.S.A. will continue to be necessary to meet domestic needs. An increase in Britain's export of naphthalene from 21,086 cwt. in 1947 to 60,906 cwt. in 1948, chiefly to the U.S.A., left inadequate supplies. Export, it is thought, will not be permitted until supplies increase, possibly through plant expansion or improved production methods. Tar supplies for distillation—2.2 to 2.5 million long tons a year—also place a limit on the production of coal-tar derivatives.

FRANCE.—A total of 30,000 tons of potash salts is scheduled for delivery to the U.S.A. in 1949, and an increase in production is planned. Restricted French imports to the U.S.A. in 1948 were the result of labour troubles and export schedule difficulties.

ITALY: Very significant progress in chemical activity has been made in Italy, where recovery of the nitrogen industry from war damage has raised production above 1938 levels. Total production of nitrogen fertilisers in 1947 was 76,715 metric tons, compared with 41,132 tons in the preceding year. In the first 11 months of 1948, production reached 97,778 metric tons, indicating a final figure for the year above the 1938 production of 99,979 tons.

CZECHOSLOVAKIA: Exports valued at about $17.17 million in 1948 did not deviate greatly from the pre-war volume. A new five-year plan calls for a general increase of 61 per cent in chemical production of coal-tar dyes, white lead, basic chemicals, nitrogenous fertilisers, urea, paints, calcium carbide, artificial fibres, and wood distillation products.

SWITZERLAND: Although the raw material situation improved in 1948, Swiss-produced superphosphates faced keen competition from imported fertilisers. Supplies for the dye industry eased, and consumption of laundry detergents declined slightly from the pre-war level.

NETHERLANDS: Increases of from 65 to 85 per cent in the production of phosphate fertilisers in 1948 as compared with 1947 are reported. In the same period, there were increases of from 30 to 40 per cent in the production of nitrogenous fertilisers, coal-tar products, and sulphuric acid.

SOUTH AFRICA: Although the demand for paints and varnishes still exceeds production, expansion of facilities is expected to bridge the gap. Shortages of imported oils, pigments, resins and solvents have been overcome.

URUGUAY: 1948 was the first recent year in which no real scarcities of chemicals were felt. Uruguay took imports of $2.6 million from the U.S.A. in 1948. Textiles and paper production increased slightly.

Government to Offer £50,000 for Peat-Fuel Research

THE Government is to finance peat-fuel engine research with an initial sum of £50,000. This offer was announced by Sir Stafford Cripps when speaking in Edinburgh, and confirms earlier reports that Government support was pending.

Three main lines of development are planned. The North of Scotland Hydro Electric Board will place a contract for the construction of a close-cycle gas turbine plant burning peat. The Ministry of Fuel and Power will place a similar contract for an open-cycle plant of the same principle. The Hydro Electric Board is in touch with John Brown & Co., Ltd., of Clydebank, which has done a considerable amount of work on closed-cycle gas engines burning oil.

The sum of £50,000 will be made available from the Development Fund and further grants are anticipated as this work proceeds. It has been indicated in Edinburgh that the Scottish Home Department originally visualised a scheme whereby peat would be milled and treated in a central plant for the extraction of waxes and by-products before being treated as fuel for the generation of electricity, or as briquettes. The probable cost of such a scheme was in the region of £2.5 million and the high cost encouraged research into other possibilities.

It has been demonstrated that peat can be used successfully as an alternative to oil-fuel in a closed-cycle turbine. For open-cycle turbines it is planned to feed wet peat and use some of the heat generated to dry the peat before burning. Steam produced in this process would be used with the combustion gases to operate the unit and give a substantial addition to the plant's capacity.

FREER DISTRIBUTION OF CHEMICALS

Chemical Traders Review Progress and Prospects

A FRANK estimation of the present degree of administrative restraints on the business interests of chemical industry and of coming prospects was afforded in the course of the annual meeting in London on Tuesday and the subsequent luncheon of the British Chemical and Dyestuffs Traders' Association.

In presenting the annual report, the chairman, Mr. A. Nash, expressed the widespread regret occasioned by the retirement of Mr. Victor Blagden from the presidency of the association, in which he had served with distinction for so many years.

Reviewing changes which had occurred in trading conditions, Mr. Nash said they had been fortunate in that no major issues of concern to the trade as a whole had arisen during the year, but said it would be misleading to say that the year was uneventful since it was one in which they had been able to return more fully to the normal function of a trade association—of giving attention to problems arising from trade activity and not from trade restriction.

The year had witnessed the relaxation of control on a number of chemicals and the revocation of the order which required a licence to be held for supplying dyestuffs. They were welcome steps towards freer markets for the merchant and, in consequence, better services for industrial consumers. The comparatively few controls now remaining were working smoothly and where possible had been made less onerous.

Details Withheld

Following the association's approach to the Board of Trade for details of bilateral trade agreements, a certain amount of information had been obtained and made available to members. There had been much unnecessary reticence in these matters by the official departments, particularly where specified commodities formed part of the trade arrangement. It was very important that such details should be made more accessible to the trades concerned.

The export of chemicals and allied materials had continued at a very satisfactory level and contributed no small part to the export drive. A prosperous overseas trade depended on the activity of British merchants and it was sometimes overlooked that the merchant was also indispensable to an efficient trading system at home since he ensured that our industries obtain the right quality materials at the right time and at the right price.

Mr. Nash affirmed that it would be unreasonable to expect the merchant to be able to meet the increasing competition in foreign markets if his services on the home market were to be restricted by grandiose nationalisation schemes; he hoped that was appreciated by the President of the Board of Trade when he urged the merchant adventurers to increase their trade with the hard currency countries.

Vigilance Necessary

In a period of rapidly changing conditions the future could not be gauged with any degree of certainty and they had therefore to exercise the utmost vigilance in all matters likely to affect the freedom of the merchant in the chemical trade.

The chairman expressed members' appreciation of the work of the officers and council and complimented the secretary, Mr. E. G. W. Paige, who had been appointed general manager and secretary.

The following were elected to serve the association during the ensuing 12 months:—

President, Mr. G. S. Bache; vice-president, Mr. C. W. Lovegrove; chairman, Mr. C. N. Stafford; vice-chairman, Mr. C. H. Wilson; hon. treasurer, Mr. L. S. Heskins. The following will form the executive council: Messrs. C. M. Bell, C. F. Blagden, T. Gregson, A. Nash and S. R. Price.

A Warning

An interesting description of some of the threats which were being presented to chemical traders in common with other business interests by current political doctrine and the course of events in German industry was given by Mr. L. D. Gammans, M.P., at the association's luncheon, following the annual meeting at the Savoy Hotel. Before the toasts, the chairman, Mr. A. Nash, announced the receipt of a gracious message from H.M. the King, in response to the association's loyal greeting on the appropriate occasion of Empire Day. A cordial message was also received from the past president, Mr. Victor Blagden, whose enforced absence was deeply regretted.

Mr. Gammans, telling members that he was in Germany a fortnight ago, called attention to the marked change in the prospects for trade and industry there. He confessed he was "rather frightened" at the prospective competition with the trade of this country. He considered they would

(Continued at foot of next page)

Further Progress in Western Germany

Search for Indigenous Raw Materials

CHEMICAL production in the Anglo-U.S. zone of Germany during March advanced to 88 per cent of the monthly average of 1936, and a further improvement was confidently predicted. In the salt and potash mines outputs rose to 114 per cent of the 1936 average, while the index for coal derivatives increased to 82. In January 224,600 persons were employed in the chemical industry, and wages amounted to Dm.37.7 million and salaries to Dm.23.6 million.

Second thoughts about the dismantling orders are rather more reassuring than anticipated. The important Badische Anilin- und Sodafabrik, Ludwigshafen, announced officially that the chemical fertiliser production, in particular, was to be expanded during 1949/50 to such an extent that additional imports of fertilisers for the three Western zones of Germany would no longer be required. The chlorine and caustic soda plants were also to increase production above the recent level.

The Farbenfabriken Bayer plant at Uerdingen has commenced the large-scale production of a plasticiser called Mesamoll, one of the uses of which is for processing polyvinyl chloride It is claimed that production of this new plasticiser largely removes the raw material troubles caused by the shortage of phosphates.

The rayon industry is among the West German industries which hope for a considerable expansion of output. The Phrix group which lost part of its raw material basis by the separation of the eastern territories hopes to improve the position by making cellulose from straw by a process formerly used at its plant at Wittenberge, in the Soviet zone, in a new factory at Neumuenster, Holstein.

The Siegburg plant of Rheinische Zellwolle A.G. which in September, 1948, resumed production of "cell jute" only has in the meantime extended its operations to embrace production of all types of rayon made by Phrix before the collapse. Glanzstoff-Courtaulds GmbH, Cologne, recently reported that its works were operating at 80 per cent of capacity.

The West German metal industry reports production of lead, zinc, and copper ores in the Harz mountains reached a monthly average of 25,000 tons in the first quarter of 1949, compared with 16,400 and 12,000 tons in the two preceding years.

FREER DISTRIBUTION OF CHEMICALS

(*Continued from previous page*)

do well to make their plans on the assumption that they would have to face a very virile Germany in which industries would enjoy lower scales of taxation, renewed equipment and a readiness to work five and a half or more, days a week. The same degree of competition was likely soon to be offered to the textile trade from Japan. Another relevant influence in industrial prospects, he suggested, was likely to be the adverse effect upon proffers of American aid and investment of the British Government policy of nationalisation. "No American in his right senses will invest his money in an industry which might be nationalised the next day . . . to make a planners' paradise,' he suggested. In the face of what was being wrought here for purely political ends, he strongly exhorted all concerned with the chemical and allied trades to join the association and to back it up; it was becoming more and more their only weapon.

He foresaw, however, that a widening of the current disillusionment with the industrial, as well as the political situation would bring great changes in the outlook of the real workers and craftsmen of this country, who would be seeking to know what alternative "to remote control from country houses" responsible industry had to offer. He strongly advised employers to give a candid response by such means as presenting simplified breakdowns of balance sheets showing how earnings actually were distributed, by explaining to workpeople just why orders were won or lost, by encouraging co-partnership and profit sharing and offering contracts of service to long-service employees.

The new President (Mr. G. S. Bache) responding to the toast of "The Association" which Mr. Gammans had proposed, confirmed that they believed their Association, as an outstanding example of a voluntary co-operation of firm's convinced of the value and virtue of private enterprise, could help to revive the great force by which this country had been built up. He looked forward to the prospect that in the next 18 months or two years they would be once more in the position to go forth and use their individual abilities and their contacts, and, best of all, perhaps, help rehabilitate the confidence in this country overseas.

The toast of "The Guests" was proposed by Mr. C. Norton Stafford and responded to by Mr. G. H. Ward.

Wider Charter for the RIC

Embracing the Whole Profession

IN the new charter, granted to the Royal Institution of Chemistry recently by H.M. the King, it is made clear that the institute is concerned with the whole profession of chemistry and not merely with that of "analytical and consulting chemistry," as stated in the original charter. The powers of the institute have been modified in certain respects so as to facilitate the progressive development of its activities and services. The title of the institute has been changed from "The Royal Institute of Chemistry of Great Britain and Ireland" to "The Royal Institute of Chemistry."

This was announced at the body's annual general meeting, at which Prof. J. W. Cook, Regius Professor of Chemistry in the University of Glasgow, was elected president in succession to Mr. G. Roche Lynch, who had now completed his period of office.

Other officers elected were: vice-presidents: Prof. F. Challenger, Mr. H. Krall, Prof. R. P. Linstead, Mr. G. Roche Lynch, Mr. J. A. Oriel, Mr. E. T. Osborne. Hon. treasurer: Dr. D. W. Kent-Jones.

Resolutions were passed authorising the council to establish under a new trust deed a residential clubs fund for providing or assisting in providing residential houses and other accommodation and facilities for the benefit primarily of members of the institute, and their dependent relatives. An appeal for financial support for this fund is to be issued shortly.

It was also resolved to amend the by-laws to provide that "citizens of Eire," as well as British subjects, shall be eligible for admission as members or for registration as students of the institute.

New Fellows and Associates of the Institute

RESULTS of the March-April examinations for the Fellowship and Associateship of the Royal Institute of Chemistry have been announced as follows:—

Pass List: Fellowships:

Branch C: Organic Chemistry. REA, ALLEN ARTHUR. Branch C: Organic Chemistry, with special reference to High Polymers. GREENHOW, EDWARD JOSHUA, B.Sc. (Lond.); HOLLOWAY, MAURICE WILLIAM, B.Sc. (Liv.). Branch E: The Chemistry, including Mircoscopy, of Food and Drugs and of Water. BUSHNELL, ALEXANDER CLAUD; DAVISON, STUART HERBERT HENRY, B.Sc. (Lond.); HALLIDAY, JAMES HENRY; HAYES, WILLIAM PEATMAN, B.Sc. (Lond.); JOHNSON, JOHN TERRENCE GEORGE; MARSHALL, JAMES HERBERT EVAN, B.A. (Cantab.); PIKE ERNEST RICHARD; STANIFORTH, VICTOR, B.Sc. (Lond.); TURNER, MERVYN EDWARD DENNANT, B.Sc. (Lond.). Branch F: Agricultural Chemistry. COLLINS, FRANK CALDWELL Branch G: Industrial Chemistry, with special reference to Petroleum. BURJOREE, HIRJEE RUSTOM, M.Sc. (Rangoon). Branch I: Water Supply and the Treatment of Sewage and Trade Effluents. LESTER, WILLIAM FREDERICK, B.Sc. (Lond.). Special Examination in Textile Chemistry. GRUSCHKA, JOHN, B.Sc.Tech. (Manc.). Special Examination in Chemical Spectroscopy. THOMAS, LESLIE CHARLES, B.Sc. (Lond.).

Associateships:

ARTHUR, DOUGLAS STUART ROLAND, B.Sc. (Lond.), The Technical College, Halifax; BARROW, EVELYN THOMAS EDWARD, The Technical College, Brighton; BIRKS, FRANK THOMAS, Woolwich Polytechnic, London, and University College, Swansea; BRYANT, KENNETH HENRY, Merchant Venturers' Technical College, Bristol; CAMM, FREDERICK ALLEN, COOK, HERBERT MICHAEL, College of Technology, Leeds; ELGAR, DEREK JOHN B.Sc. (Lond.), FISHER, JAMES EDWIN, The Technical College, Brighton; GARDNER, MISS JOYCE ELIZABETH, The Technical College, Coventry; GIBBS, BRIAN MONTAGUE, B.Sc. (Lond.), The Technical College, Brighton; HOUGHTON, FRANCIS RICHARD, Wigan and District Mining and Technical College; HOWARD, GEORGE ERIC, B.Sc. (Lond.), Battersea Polytechnic, London; JACKSON, GEORGE, Municipal Technical College, Hull; JENKINS, HENRY AUSTEN, Technical College, Cardiff; KEMP, ALAN RONALD, The Polytechnic, London; LOVETT, STANELY, Constantine Technical College, Middlesbrough; MAKER, DERYK LEONARD, University College, Exeter; MATTHEWS, ROY DEREK, The Technical College, Coventry; MAXWELL, GEORGE EDWARD, Rutherford College of Technology, Newcastle-upon-Tyne; MOSS, KENNETH, Bradford Technical College and others; MURRELL, CLIFFORD JOHN, The Polytechnic, London; NAVA, HAROLD ANTHONY, City Technical College, Liverpool; NORTON, PHILIP DOUGLAS, Merchant Venturers' Technical College, Bristol; POPPELSDORFF, FEDOR, The Polytechnic, London; ROBINSON, EDWARD LEAVER, Blackburn Municipal Technical College; SHACKLETON, RONALD, The Technical College, Doncaster; SMITH, KENNETH FREDERICK, Royal Technical College, Salford; SPICKETT, ROBERT GEOFFREY WILLIAM, Woolwich Polytechnic, London; THOMPSON, RONALD JOHN, Harris Institute, Preston, and Northern Polytechnic, London TRAPPE, GORDON, Royal Technical College, Salford.

"Unscrambling" Steel

Speaking in Glasgow last week of the effects of the Government's nationalisation policy, especially in connection with steel, Mr. Winston Churchill said: "No industry has done more magnificent work (than steel) in achieving all targets set both for our export trade and internal needs. None has a finer record in the relations of the management and the men. Yet the whole steel industry is first to be bought out at a heavy cost, then transferred to the grip of State officials and Socialist politicians, and thereafter run at the expense of the taxpayer and the consumer.

"The nationalisation of steel will be a precise and definite issue at the General Election, and should we obtain a majority in the new Parliament we shall immediately repeal, and by every means in our power reverse, this pernicious measure."

Industrial Safety Conference

New Accident Statistics Being Compiled

NEARLY 450 delegates, the largest number recorded since 1936, were present at this year's National Industrial Safety Conference at Scarborough from May 13-15.

Delegates were welcomed by Lord Llewellin, president of the Royal Society for the Prevention of Accidents, which organised the conference, and all the principal industries were represented.

In his presidential address Lord Llewellin said that the ideal method of preventing an accident was to make it physically impossible by so designing machinery and plant that no failure of the human element could produce an injury. Attention paid to safety when the machine and process were planned was the best means of reducing hazards. More and more effort. was being made, he said, to enlist the co-operation of the chemist and the engineer.

A Review

The Industrial Injuries Act was the subject of the paper by Sir Geoffrey King, deputy secretary, Ministry of National Insurance, who dealt with the effects of new legislation and the attitude of employers and workers.

Close inquiry was being made into the number and classification of accidents, the speaker said, and, although he had misgivings as to the value of gross statistics, he would welcome any ideas as to how the best use could be made of the information being collected.

Among a number of interesting papers was that by G. W. Tice, safety officer, B.X. Plastics, Ltd., on "Tidiness as a Factor in Accident Prevention." A large proportion of works accidents, he said, were associated with untidiness. Tidying up should be regarded as a part of each job performed and not necessarily work for a lower class of labour.

Removal of dust was essential to reduce the danger to health involved in many processes and to lessen the risk of fire or explosion. Vacuum cleaning was preferable. Where water was used, a considerable saving could be effected if the floor was first sprinkled with a wetting-out agent. It should be remembered, however, that certain wetting-out agents, particularly those in a concentrated form, are corrosive and may also react with chemicals in the dust.

Oil and grease from machinery when it mixes with dust on the floor makes a dangerously slippery surface, so that drip trays should be built in wherever possible to catch any escape from glands and bearings.

Waste and salvage, the disposal of refuse and effluent, and storage of materials and containers all played an important part in the reduction of hazards, if they were correctly carried out.

Research laboratories tended frequently to give little thought to tidiness. Tidiness however should be just as important here, or even more so, than elsewhere in the works. While the work was varied and always changing, the same care should be observed in segregating the various materials for disposal.

The engineer's views on industrial safety were outlined in a paper given by G. W. Clarke (Standard Telephone & Cables, Ltd.), who said that the ultimate aim must be to provide equipment that not only aided production but proved to the operator that the safest way was also the easiest and least tiring.

(Continued at foot of next column)

American Microchemistry

Current Instruments in Atomic Work

PROBLEMS dealing with microscopic quantities and requiring extremely fine measurements play an increasingly important part in modern chemical and scientific investigation.

This has led in the U.S.A. to much development and application of microchemistry and ultramicro techniques have become a highly specialised subject.

One aspect has been the application of microchemistry to the problems of nuclear physics by the Argonne National Laboratory, some of whose apparatus used to investigate the properties of plutonium and the other transuranium and radioactive elements are depicted on the facing page.

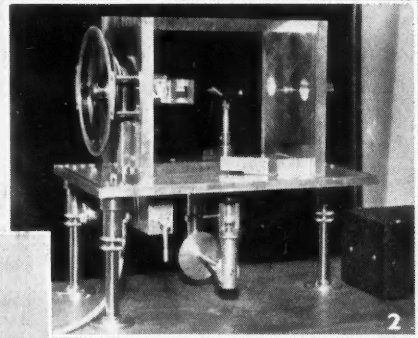
In the torsion fibre microbalance (2) the beam of the balance is attached to a quartz fibre which runs to the wheel on the left. When a platinum weighing pan (1) is suspended from the beam, the beam is pulled down and the fibre twisted. The weight of the pan and its contents can be represented by the extent to which the wheel must be turned before the beam is level again. An optical device with magnifying lens is used with the instrument.

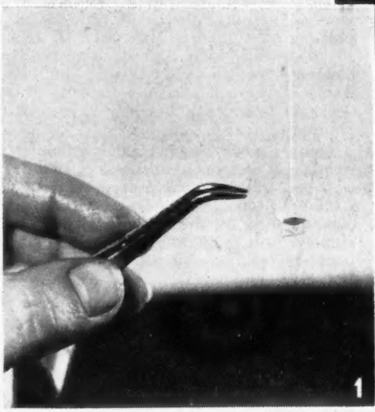
The microcone and micropipette (3) are adjusted by the screws of the micromanipulator. When the solution (generally less than 0.1 millilitre) is driven out of the pipette, the reaction is observed through the microscope.

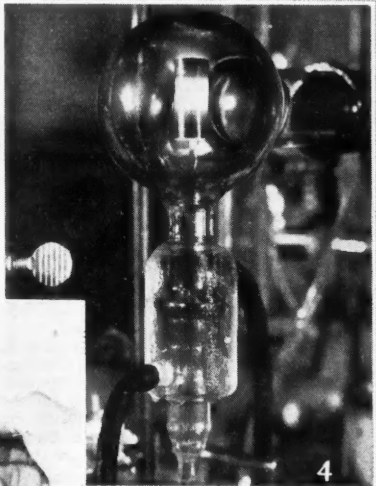
The electric furnace (4) glows brightly inside a glass bulb, from which the air has been extracted, and heats the microcrucibles to high temperatures.

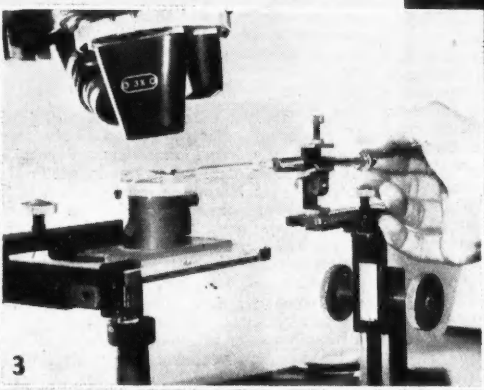
Advanced Methods of Microchemistry

1. The weighing pan of 0·002″ platinum foil placed on a quartz fibre cradle. 2. Simplified model of the torsion fibre microbalance. The weight of the pan and its contents can be ascertained by the rotation of the wheel on the left required to restore the beam to a level position









3. A microcone (directly under the microscope) being charged with a chemical solution from a micropipette. 4. One of the evacuated glass bulbs serving as an electric furnace

UNITY AND DIVERSITY OF ISOTOPES

New Concepts Resolve Some Old Anomalies

From a Special Correspondent

THE term "isotopes" is used to refer to elements of the same atomic number but different atomic weights. Moseley suggested that the atomic number was equal to the nuclear positive charge, and therefore, since the atom is electrically neutral, to the number of external electrons in the atom.

Hydrogen, it will be recalled, has an atomic number of 1, a positive nuclear charge of 1 unit (equal in magnitude but opposite in sign to the electronic charge e), and one external electron; helium (atomic number 2) has a positive nuclear charge of 2 units and 2 external electrons; lithium (atomic number 3) has a positive nuclear charge of 3 units and 3 external electrons, and so on up to uranium (atomic number 92) which has a positive nuclear charge of 92 units and 92 external electrons.

Major Discrepancies

Although the significance of arranging the elements in order of increasing atomic weights had been appreciated by Newlands and had been greatly extended by Mendeléeff in his Periodic Classification, it was not until Moseley's time that the physical basis of the significance of the arrangement was appreciated. But even when Moseley had established a clear relation between the physical properties of the atom and its atomic number, there were still two major discrepancies that required clearing up:—

(1) There were a few cases in which neighbouring atoms in the atomic number series had anomalous atomic weights. It had long been abundantly clear, for example, that iodine (atomic weight 126.92) must be in Group VII of the Periodic Classification for there could be no possible doubt that it belonged to the same family as the other halogens and that tellurium (atomic weight 127.61) belonged to Group VI.

The atomic number of tellurium was clearly 52 and that of iodine was 53, and yet iodine had a lower atomic weight than tellurium. Although meticulous experimentalists had devoted the best part of their lives to attempts to resolve this and a few similar anomalies, their results only confirmed the existence of the anomalies.

(2) In view of the known structure of the atom, *viz.*, that of a heavy nucleus with a charge known to be an integral multiple of e, there was good reason to expect the atomic weights of the elements to be whole numbers, whereas many elements, typical of which is chlorine (atomic weight 35.457), had fractional atomic weights

Mass Spectrograph

In addition, the study of radioactivity showed that "varieties" of an element with differing half-lives could occur, *e.g.*, ionium was a variety of thorium (atomic number 90) and their respective atomic weights were 230 and 232.12. Soddy called such pairs of substances "isotopes." J. J. Thomson showed that many non-radioactive elements consist of mixtures of isotopes. Aston developed the mass spectrograph to separate isotopes sufficiently to record them photographically.

Aston's work showed clearly that a large number of elements consisted of two or more isotopes and that these isotopes had whole number atomic weights. This discovery cleared away all the anomalies that had previously been so troublesome; chlorine, for instance, is now known to consist of two isotopes of whole number atomic weights 35 and 37, while tellurium consists of seven isotopes of atomic weights 122, 123, 124, 125, 126, 128, 130.

Once the existence of isotopes was appreciated, it became a problem of some moment to separate them. The problem was beset with difficulties, and it was at one time thought by many that it might well prove to be impossible to effect a separation. Chemical means were clearly useless, for the chemical properties of an element were determined by the number and arrangement of the external electrons.

Chemical Properties

Both isotopes of chlorine (35 and 37) had 17 external electrons and both would undergo the same reactions. For a long time a great deal of evidence accumulated to show that isotopes were identical in their chemical properties, largely the result of failures to separate them by chemical means, and that with the exception of isotopes of radioactive origin the relative abundance of the isotopes of any element was constant, *i.e.*, from whatever source an element was obtained its isotopes were always present in the same proportions.

It has, however, long been evident that any property which depends on atomic mass will not be identical in isotopes and the variation in such properties offers a

means of separating isotopes. The production of heavy water rich in deuterium (hydrogen of atomic weight 2) and of uranium hexafluoride rich in uranium 235 afford examples of the successful application of such methods.

Other elements such as those of neon and mercury have been at least partially separated into their isotopes by methods such as those of fractional diffusion through a porous material, fractional distillation, and fractional evaporation.

Extra-Nuclear Structures

It has recently been shown that, despite the unity of the chemical properties of isotopes due to their possession of similar extra-nuclear structures, some diversity can occur. This was first observed in the case of deuterium in which the mass difference from hydrogen is so great, that the chemical properties are affected.

Careful investigation has shown that minor differences in chemical behaviour are also to be found between isotopes of some other elements. At the present time carbon of atomic weight 13, nitrogen 15 and deuterium are being produced commercially by chemical methods.

If for example propane —1--C^{13}, *i.e.*, propane in which a terminal carbon atom is heavy, is made and this material is cracked at 500-550°C. the C^{12}-C^{12} bond ruptures more frequently than the C^{12}-C^{13} bond, so that some enrichment of C^{13} can be obtained by this method. If, too, ammonia gas is passed up a column against a flow of ammonium nitrate solution, there is some transfer of N^{15} to the liquid phase and by using a compound system of columns, concentrations up to 72 per cent N^{15} have been prepared.[1]

Heavy Water

There is, of course, no change in the absolute ratio of N^{14} to N^{15} molecules, and when one remembers that the temperature of equilibrium for the observed concentrations of atomic nuclei has been estimated[2] to be of the order of 10^{10} °K it is not to be expected that any such change could take place; but there is a re-distribution of the isotopes; so that if heavy water is made a corresponding reduction is made in the deuterium content of the bulk of water from which it is extracted.

The view that was formerly held that there was a rigid constancy in the proportions of isotopes in Nature, has as the result of more precise analyses, had to be abandoned.

Teis and Florenskii[3] have reported that the water coming from the melting of the Upper Svanetian glaciers is heavier, *i.e.*, it contains more deuterium than that composing the river into which it flows.

Thode[1] has given an impressive list of these variations in abundances of isotopes in Nature; some of these are as follows:—

1. Considerable variations in the abundances of the sulphur isotopes; mass spectrometer measurements show that the ratio S^{32}/S^{34} varies by as much as 5 per cent. In particular, sulphates have a high S^{34} content.
2. The distribution of BB^{11} and B^{10} in borax varies. Thode reports that in one investigation a sample of unknown origin was analysed and found to have a B^{11}/B^{10} ratio similar to borax from Turkish deposits. Later it was found that this sample did originate from Turkey. It is easy to visualise the use of the isotopic ratio as a means of determining the origin of a material.

Limestone

3. The isotope C^{13} is more concentrated in limestone than in plant life. As it has been found that the C^{12}/C^{13} ratio in carbonaceous pre-Cambrian material is similar to that which obtains in plant life, it is clear that the carbon was formed by organic processes, so that the earliest trace of life on the earth is pushed back to late Archean times, *i.e.*, 600-700 million years ago.
4. The oxygen in sea water is less rich in O^{18} than is atmospheric oxygen. A difference of nearly 7 per cent has been found in the relative abundance of O^{18}; the richest source was limestone, and the poorest was glacier water. Evidently, during the life of the earth, as calcium carbonate has precipitated from sea water to form the limestone rocks it has carried with it more than its share of O^{18}.
5. It has been reported that algae, aquatic monocellular weeds such as the green scum that forms on ponds, contain 2.97 per cent less C^{13} than the carbon dioxide in the solution in which they grew.
6. When oxalic acid is heated to form carbon dioxide, carbon monoxide and water, the CO_2 is found to contain about one per cent more C^{13} than the CO.
7. Inasmuch as the temperature at which calcium carbonate crystallises from water solution affects, even although only very slightly, the O^{18} concentration, it should be possible by examination of the O^{18} content of fossils to measure the temperatures which prevailed tens of millions of years ago when the precipitation occurred.

REFERENCES

[1] H. G. Thode, *Research*, 1949, **2**, 154-161.
[2] C. Lattes and G. Wataghin *Anais acad. brasil cienc.*, **17**, 269-70,1945 (*C.A.* 1946, **40**, 6333).
[3] R. V. Teis and K. P. Florenskii, *Compt. rend. acad.sci. U.S.S.R.* **47**, 640-1 (*C.A.*, 1946, **40**, 3947).

PRECISE PRESSURE MEASUREMENT

French and American Views on Modern Practice

A FRENCH writer has recently remarked that extremely accurate measurements of pressure are rarely met, or presumably required, in current industrial practice. That statement seems to require some qualification or more precise definition of the phrase "extremely accurate." It is quite a common experience that the need for such measurement in industry to-day is now greater and more insistent than ever, and knowledge of the underlying principles and design of suitable instruments is of the utmost importance.

Simple Process

The instruments are, however, not necessarily always complicated. On the contrary, the new type of manometer, for instance, recently introduced, and described in the *Journal of the Franklin Institute* (1948, *246*, 184-5) is said to combine extreme simplicity with remarkably high precision in making either absolute or differential measurements of pressure and vacua.

It reduces the arduous task of cleaning and filling a closed end to the comparatively simple process of cleaning and filling an open end U-tube type. Only a single reading is required to obtain accurate measurement at the given temperature reduced to mercury mm. at 0° C.

The underlying principle is this: the closed end is provided by a U-tube, which traps mercury to form a vacuum seal, and an oblique bore stopcock above the trap to hold up the mercury seal. For differential readings the stopcock is kept open and connected to a lower source of pressure.

True Pressure

The ratio of diameters of the manometer tube and reservoir is adjusted exactly to counteract any increase in mercury height due to its lower density at room temperature. Thus a single reading of the mercury level in the tube gives the true pressure at 0° C. The coefficient of expansion of the vinylite scale is such that a precision of 0.1 mm. is maintained for room temperature variation between 20° and 30° C. The range is 0 to 200 mm.

An important addition to the series of highly sensitive differential manometers was developed by H. Matheson and Murray Eden, of the U.S. National Bureau of Standards (THE CHEMICAL AGE, *60*, 129-30), for pressure differences as small as $1/10^9$ atmos. over a range from 1 mm. Hg to 1 atmos.

Its basic principle is that of an aneroid barometer, and it is especially useful in vapour pressure work and for replacing slope gauges in the measurement of small pressure differences.

In a paper recently read at the Centre de Perfectionnement Technique, Paris, Louis Le Blan gave an interesting account of the elements and fundamentals of precise pressure measurements, those above atmospheric, and excluding vacua, and roughly classified the various degrees of exactitude into four groups: (a) industrial, within 10^{-2} error, (b) laboratory, within 10^{-3}, (c) high precision within 10^{-4}, and metrologic, within 10^{-5} to 10^{-7} (*Chim. et Ind.* 1949, *61*, 235-239).

Time Factor

For the first or industrial group, metal manometers are chiefly used, with a tolerance of ±2 per cent. The better types, however, reach or closely approximate to the standard grade and may have accuracy within 1 per cent or less, i.e., an effective precision of 1/500. Accuracy, of course, involves the time factor, that is the possibilty of giving consistent readings over a period of time. Metal manometers are liable to error, in this respect, due to deformation; and this in turn may be caused by (a) exceeding the elastic limit of the metal in various ways, or (b) subjecting the tube in course of manufacture to thermal or mechanical treatment whereby its structure becomes unstable.

It follows that a metal manometer must have a large factor of safety against overpressure, and, as a rule, for constant work not above two-thirds of the range should normally be exceeded; further, rapid changes or pulsations, as well as mechanical vibration, should be avoided. This class of manometer is also generally subject to temperature effects, unless special precautions are taken in its design and use.

Of the somewhat higher grade or standard manometers there are two types: the one using mercury and the other a piston. The former, of course, were the earliest used, as mercury had several special advantages for the purposes, such as easy availability and high purity; it was little affected by air under usual conditions of use, and it formed a convex meniscus in a tube, with high reflecting power.

An ordinary mercury barometer may be briefly explained with reference to Fig. 1. By means of a suitable plunger the upper level is adjusted a few microns below the higher point, and the lower point adjusted a few microns above the lower level. With a cathetometer telescope with axis at horizontal the free surface of the mercury is sighted, and by noting the position of the points above mentioned and their reflection, it is possible (with a scale graduated in mm.), so to adjust the reticule of the telescope that the vertical displacement thereof may be measured within 1 micron. In other words an accuracy in the readings of the mercury column within 4 microns on total height of column is possible. To achieve this, the graduated scale must, of course, be very accurate.

Margin of Error

Range of error in respect to recording of atmospheric pressure may be thus derived: If height of column is 760 mm. relative error is $\pm \frac{5.10^{-3}}{760} = \pm 7.10^{-6}$. To this must be added the error arising from density of mercury and ignorance of exact temperature in the column. But fairly accurate allowances for both these factors are obtainable. Taking into account also the linear expansion of mercury, it is found that the degree of accuracy attainable in measuring atmospheric pressure is within 10^{-5}. Error due to curvature of the mercury meniscus is very slight and can be eliminated by having a tube of sufficient diameter, 30-35 mm., so that the meniscus has a flat plane centre.

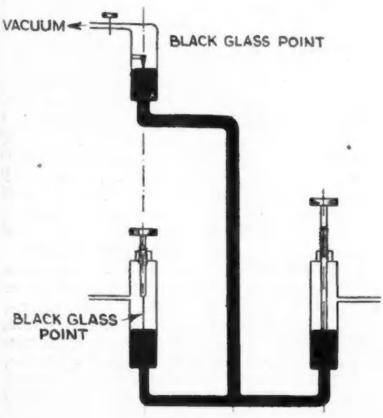


Figure 1

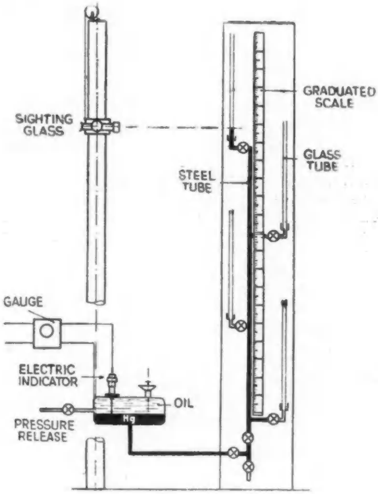


Figure 2

The mercury manometer can be widely used in the laboratory, but in order to achieve results with an accuracy within 10^{-4} it is essential to fulfil certain conditions. Sighting of the upper and lower levels must be very accurate; the latter (lower level) is usually an oil/mercury interface. The ambient temperature must be kept constant.

Considering these conditions more in detail, it is clear that with very long columns (e.g., several metres) the diameter cannot be such that capillarity is negligible. In this connection Le Blan (*loc. cit.*) recommends the use of a central steel column from which may branch glass tubes of about 1 m. in length carefully graduated, as shown in Fig. 2. Sighting of the levels may be thus facilitated. Oil is generally the other essential liquid for use with mercury, and air must be excluded. It is very difficult to sight accurately an oil/mercury interface; and it is suggested that an electric indicator be used as shown.

French Asbestos.—A quarry for the exploitation of an asbestos seam has been opened up in the Saint-Gaudens region in France. Analysis shows the product is similar to Canadian asbestos, comprising 38.07 per cent silica, 4.00 per cent alum, 40.70 per cent magnesium, 1.80 per cent iron oxide, 0.80 per cent lime. Fusion point is 1400°C.

American Chemical Notebook

(From Our New York Correspondent)

THAT the production of electrical power from atomic energy would be a reality in about four-and-a-half years was predicted last week by Mr. David E. Lilienthal, chairman of the U.S. Atomic Energy Commission, who made the statement following a recent meeting between himself and fellow AEC-commissioners and President Truman. He added, however, that the initial production of electricity by nuclear reactor would not be cheap enough to compete with eletric power. The first power reactor will be built in the autumn at the new 400,000-acre reactor testing "farm," which the commission recently announced it was establishing at Arco, Idaho. Mr. Lilienthal described the venture as "the greatest single technical problem we have.'

* * *

After five years of laboratory research and pilot plant development, a new type of tin-lead bar solder which is machine-cast, instead of being cast by hand, has been developed by the Federated Metals Division of the American Smelting and Refining Company and will be marketed under the trade name of "Castomatic." The new solder is stated to have proved superiod in over two years of tests. In the casting machine, the molten solder is contained in a completely closed system from melting kettle to mould. All operations are fully automatic, and each step in the manufacturing cycle is timed to fractions of a second by electronic controls. Oxides in the metal are eliminated by the system being closed to air during melting and casting, and the resulting solders are said to possess improved fluidity and easier working properties Uniformity of composition and almost complete absence of variation in weight are claimed. Also, chemical tests and photo-micrographs have revealed that segregation of the solder elements, not uncommon in hand-cast bars, is virtually eliminated, ensuring a uniform melting temperature from one end of the bar to the other.

* * *

Cheaper "bottle gas" is promised for consumers with the success of a new process, called "hypersorption," for removing propane, its chief component, from natural petroleum. Discussing the new process, Mr. Ben M. Holt, of the Ralph M. Parsons Company, Los Angeles, Cal., said that hypersorption was more economical, when compared on a common basis, than the conventional oil absorption method of extracting propane. It was more economical to extract 98 per cent of the propane contained in the field gas by an absorption-hypersorption process than to recover 80 per cent of the propane by an oil absorption process. An investment of $1.59 million for a hypersorption plant processing 20 million standard cubic feet of gas a day shows a propane recovery of 22,000 gallons of propane or "bottle gas." This compares with a plant investment of $1.91 million for an oil absorption plant processing the same quantity of gas and recovering only 17,950 gallons a day of propane.

* * *

Development of a phenolic moulding powder with improved properties was announced last week by the Monsanto Chemical Company, which said that the new Resinox powder was developed to meet the demand of moulders of utensil handles and knobs for a phenolic powder that withstood extremes of thermal shock and still retained a high degree of gloss. The new product is named Resinox 10231 Black, and in a series of tests conducted by the company is stated to have withstood exposure to temperatures ranging from 400° to 500°F. for more than 100 hours. In another test, the material was transferred immediately from room temperature to a hot oven without any evidence of the blistering that usually results in tests of less resistant material.

* * *

In the recent U.S. drive to build synthetic petroleum plants, the commercial hydrocarbon synthesis equipment, based upon a modified Fischer-Tropsch reaction, can be expected to produce a variety of aliphatic oxygenated compounds as by-products. These facts were brought out at a recent regional meeting of the American Institute of Chemical Engineers by Mr. T. Q. Eliot, Mr. C. S. Goddin, Jun., and Mr. B. S. Pace, of the Stanolind Oil and Gas Company, Tulsa. The three authors said that one 10,000-barrel-a-day plant—which is small as far as petroleum production is concerned, would produce 7 per cent of the nation's ethyl alcohol, 9 per cent of the acetic acid, 3 per cent of the acetone, and 6.7 per cent of methyl ethyl ketone. Rare chemicals such as methyl butyl ketone, not now available in production quantities, would be produced for the chemical industry. The chemicals are recovered as by-products from the hydrocarbon synthesis process for making synthetic petroleum.

Parliamentary Topics

Metal (Government Purchases). Replying to a question from Col. O. E. Crosthwaite-Eyre, Mr. G. R. Strauss, Minister of Supply, said £4,693,382 was paid in hard currencies between April 1 and May 7 for zinc, copper and lead previously ordered and mostly shipped in March and April. Since there was a steep fall in prices in these months this metal, if purchased at the date of delivery would have cost about 15 per cent less. The necessary supplies for early delivery could not, however, have been assured in this way and, moreover, for some of this metal there must in any case be a time lag of several weeks between purchase and delivery. For these reasons any hypothetical cost comparison of this kind was wholly misleading. It was quite wrong to say that we were committeed to long-term contracts. Most of our contracts were for about three months.

Chemical Industry. In reply to a further question from Mr. Ellis Smith, asking why the chemical industry was not included in the list of industries to be investigated by the Monopolies Commission; and if he would make a statement on restrictive practices in the chemical industry in the past 20 years, Mr. A. G. Bottomley said the Monopolies Commission was a permanent statutory body and the list of six cases already referred to it would be added to from time to time. He did not think any useful purpose would be served by the publication, before investigations by the commission, of the information at present available about particular industries.

Caustic Soda and Soda Ash. In reply to Mr. Ellis Smith, Mr. A. G. Bottomley, Secretary for Overseas Trade, said all demands for soda ash and caustic soda were being met in the home market. This was also true of export demands for soda ash, though some increase in exports of caustic soda might be possible if supplies were available. The alkali industry had been expanding steadily since 1929, apart from the war years when expansion schemes were stopped. Schemes were now in progress to meet the anticipated gradual increase in home and overseas demand.

British Industries Fair. Mr. A. G. Bottomley, Secretary for Overseas Trade, replying to a question from Mr. H. Sutcliffe, said, according to reports received from exhibitors and from the officials concerned with the BIF in London and Birmingham, both the volume of orders received and the nature of the inquiries from overseas suggested that the ultimate results were likely to surpass those of the 1948 Fair.

Next Week's Events

MONDAY, MAY 30

Canadian International Trade Fair. Toronto (until June 10).

TUESDAY, MAY 31

Society of Chemical Industry. (Plastics Group) London: Reubens Hotel, Buckingham Palace Road, S.W.1, 5 p.m. 17th annual general meeting; 7 p.m. informal dinner: principal guest, Mr. Edward A. O'Neal, Jun., chairman, Monsanto Chemicals, Ltd.

Society of Instrument Technology. London: Manson House, Portland Place, W.1, 6.30 p.m. Annual general meeting. Prof. H. S. Gregory and E. Rourke: "Some Modern Aspects of Hygrometry."

British Association of Chemists. Derby: Midland Hotel, 7.30 p.m. Discussion, opened by the president, Norman Sheldon: 1, "The need for affiliation between the RIC and the BAC"; 2, "Nationalisation as it affects the chemist."

WEDNESDAY, JUNE 1

Royal Institution. London: Burlington House, Piccadilly, W.1, 9 p.m. Dr. Edwin H. Land, president of the Polaroid Corporation, Cambridge, Mass.: "Optical Polarisers."

THURSDAY, JUNE 2

Institute of Packaging. London: Waldorf Hotel, Aldwych, W.C., 6 p.m. Film and paper on "Fork Lift Trucks."

SCOTTISH STEEL EXHIBITION

OPENING on May 17 an iron and steel exhibition in the M'Lellan Galleries, Glasgow, in which 26 manufacturers participated, Dr. David S. Anderson, Director of the Royal Technical College, Glasgow, told the sponsors—the Scottish Region Exhibition Committee of the British Iron and Steel Federation—that they had shown a splendid example of not letting circumstances get them down. . . . "Considering that the sword of Damocles—or the bludgeon of Bevan—is hanging over the head of the industry."

Dr. Anderson added that in training, industry and education joined hands. One of the most satisfactory forms of training was a sandwich system with alternate periods of theoretical and practical training. That was a form strongly supported by the iron and steel industry, and the Royal Technical College collaborated in a four-year course arranged on that basis.

Personal

TRIBUTE to Sir Robert Robinson, president of the Royal Society, was paid at Liverpool University last week, when he, together with Mr. Winston Churchill and other distinguished visitors, received the honorary degree of Doctor of Laws. The Public Orator (Prof. W. Lyon Blease), speaking of Sir Robert, referred to his distinction as an organic chemist and said: "We honour him as a discoverer, as an explorer, and as a pioneer."

At a congregation of the University of Leeds last week, the degree of D.Sc. *honoris causa* was conferred on MR. A. T. GREEN in recognition of his services to the science of ceramics. Dr. Green is director of research of the British Ceramic Research Association, and hon. general secretary of the British Ceramic Society. For 30 years he has been actively associated with research, serving under the late Dr J. W. Mellor, F.R.S., first director of research of the British Refractories Research Association, whom he later succeeded.

MR. HAROLD J. G. WATKIS, who retired in April, as a buyer in the central purchasing department in London of Imperial Chemical Industries, Ltd., has joined one of the associated companies of Reads, Ltd., to supervise the marketing of certain products which should be available for home and export use early in 1950.

MR. C. G. CONWAY, of the Mond Nickel Co., known for his work on the development of high-temperature materials, and particularly the Nimonic alloys, has been appointed to the technical staff of Power Jets (Research and Development), Ltd.

DR. MOWBRAY RITCHIE, Department of Chemistry, Edinburgh University, has been awarded the Makdougall-Brisbane prize for the period 1946-48 by the council of the Royal Society of Edinburgh for his papers on thermal diffusion.

At the meeting of the council of the Association of British Pharmaceutical Industry last week, MR. R. L. TAYLOR was elected chairman of the association, MR. J. C. HANBURY, vice-chairman, and MR. H. C. H. GRAVES was re-elected honorary treasurer. Tribute was paid to the services rendered to the association by the retiring chairman, MR. C. A. O. RIDEAL, who, as immediate past chairman, remains on the council as an executive officer.

The following officers and executive committee of the Association of British Sheep and Cattle Dip Manufacturers were elected at the recent annual general meeting:—

Chairman, Mr. D. O. MARSHALL; vice-chairman, Mr. V. G. GIBBS; hon. treasurer, Mr. W. E. O. WALKER-LEIGH; hon. auditor, Mr. R. J. HOPE; secretary, Mr. W. A. WILLIAMS.

Executive Committee: Messrs. H. W. BARKER, R. J. HOPE, R. W. LOWE, W. M. MACMILLAN, A. S. ROXBURGH, W. E. O. WALKER-LEIGH.

MR. T. H. BENNETT, M.P.S., has been appointed managing director of Evans Medical Supplies (India), Ltd., in succession to Mr. N. McQueen, who is returning to the United Kingdom. Mr. Bennett, who has already taken up his new duties in Bombay, was formerly manager of the Evans branch for South-east India.

One of the largest sums ever presented by the Royal Commission on Awards to Inventors has been shared between three young scientists who will receive £36,000 tax free. They are PROF. J. T. RANDALL, Professor of Physics, King's College, London, and DR. H. A. H. BOOT, Birmingham University, who working together in the early days of the war, invented the cavity magnetron, which has been described as "the heart of radar," and PROF. J. SAYERS, Birmingham University, who later devised an important improvement.

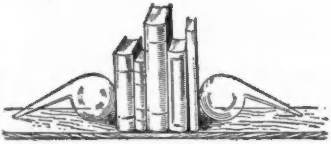
COUNCILLOR JAMES FREDERICK COLLARD COLE, director of Cole & Wilson, Ltd., colour and chemical merchants, and chairman of the Corporation Sewage Works Committee, has been nominated by the Conservatives as one of Huddersfield's four new aldermen.

MR. JOSEPH A. PENNY, manager of the Scottish Co-operative Wholesale Society soap works in Grangemouth, has been elected Provost of the town.

MR. ADAM GLEN ALEXANDER, of Rosemoor Drive, Crosby, Liverpool, a director of Ayrton Saunders & Co., manufacturing chemists, left £7043.

Obituary

The death occurred on May 11, at the age of 68, of MR. DOUGLAS JOHN DAVIS, proprietor and co-founder with Mr. Walter Smith, of Leicester, of the Smith Chemical Co., of Battersea, S.W. He was one of the chief chemists engaged on the production of TNT during the 1914-18 war.



A CHEMIST'S BOOKSHELF

Organic Reagents Used in Gravimetric and Volumetric Analysis. John F. Flagg. 1948. New York and London: Interscience Publishers. Pp. xiv + 300. 36s.

The Interscience series of textbooks on chemical analysis, of which this is No. 4, needs no introduction to the analytical chemist. Although several well-known works dealing with the theory and applications of organic reagents to inorganic analysis exist, Dr. Flagg has rightly concluded that it is not possible to do justice to the whole field in one book of reasonable size, and he has therefore generally limited his discussion, as the title indicates, to those reagents which produce precipitates with inorganic ions, the precipitates being subsequently determined gravimetrically, or redissolved and determined volumetrically. The whole range of reagents used for colorimetric analysis is therefore excluded, and a much more compact consideration of an important branch of analytical chemistry is therefore possible.

Dr. Flagg, wisely, has not attempted to discuss theories of the formation of metal-organic complexes in terms which have unfortunately survived in analytical chemistry, and which seem curiously imprecise to anyone familiar with modern theories of the structure of these complexes. That is not to say that the book neglects theoretical aspects. The first half gives a valuable and clear statement of structural theory, and particularly of the relation between structure and analytical properties, as far as present-day knowledge goes. The author does not hesitate to say at times that specific information is wanting, or that published data are unreliable. One of the most important functions of this section is the way it underlines the body of work which still requires to be done. Solubility theories as applicable to this field are competently discussed, and much useful information is given as to how these can be applied. There is a valuable review of techniques in gravimetric and volumetric analysis which are specially important when using organic reagents.

In the second part of the book two dozen reagents or groups of reagents are considered in detail, many of the more important being the subjects of separate chapters. A full discussion of the behaviour of the reagent, and detailed instructions for its use in a variety of determinations, are given, and this is often supported by stimulating critical comments which will suggest to the reader further lines of investigation. Of particular interest is the inclusion of rather unusual methods of finishing determinations which are not ordinarily met with in the general run of textbooks. The book is fully documented by a comprehensive collection of references to the original literature.

Very few mistakes have been noted: the printing of the dioxime grouping in the *amphi*-form on page 16, followed by a discussion of the steric effects and the emphasis on the *anti*-form as the most important reagent, should be amended; there is a discrepancy in the spelling "thioglycollic" on pp. 28 and 273. Again, the subject index could usefully be more comprehensive: although thioglycollic acid is mentioned twice in the text, one of these being a major reference, it appears in the index only under one of its three possible synonyms; a similar state of affairs applies to other reagents which have alternative names; it is also impossible by any ordinary ingenuity in seeking possible cross-references to track down in the index the brief, but quite important discussion of the isomeric nickel glyoximes on page 41.

These criticisms do not detract seriously from the value of the book as a whole. It is a major contribution to the literature on organic reagents in inorganic analysis, and should be available to any analytical chemist, since the field of organic reagents is now one with which every analytical chemist must be thoroughly familiar.

The Atomic Age

The large numbers who last year attended the series of lectures in London on "The Atomic Age" will welcome the publication in book form of these authoritative addresses. It presents the opinions on the use or abuse of atomic power by such experts as M. L. Oliphant, P. M. S. Blackett, R. F. Harrod, Betrand Russell, Lionel Curtis, and D. W. Brogan, who collectively gave the six lectures. The volume is published by George Allen and Unwin, Ltd., London, price 7s. 6d.

NEW ENTERPRISES IN SOUTH AFRICA

American Interest in Current Development

AMERICAN interest in the development of South Africa's industries is reflected in the plans of the Chemical Services (Pty.), Ltd., Johannesburg, which has established a factory in Port Elizabeth. There they will make American rust-proofing materials on the lines of the Parker Company in Detroit, while it is also intended in the near future to produce degreasing materials and chemical substances for the motor trade to the specifications of the Magnus Chemical Co., Garwood, New Jersey. The United Kingdom is represented in the company's project to manufacture products of the British Hydrological Corporation, London, especially bottle washing chemicals.

* * *

The Liquid Fuel and Oil Industry Advisory Boad met in January to consider objections to the issue of a licence to make oil from coal to Anglo-Transvaal Consolidated Investment, Co., Ltd. These objections, however, were of a purely technical nature, requesting certain comparatively minor amendments to the conditions under which the licence was granted. The restrictions imposed in the licence will, in the national interest, prevent the company from acquiring a monopoly for the manufacture of liquid fuel and oil from coal, but investors will be ensured of a fair return on their outlay and users of liquid fuel and oil will get these products at the lowest price possible.

* * *

The specification for salt issued by the South African Standards Institution in 1943 has been revised to include many improvements, particularly on the question of the presence of trace elements in table and dairy salts and the effect of impurities in salt used for curing hides and skins. The revised edition of the specification has been declared a South African Standard Specification by the Minister of Economic Affairs.

* * *

Plans to develop a new local industry by extracting iodine and other commercial products from seaweed have been made by a Cape Town firm. Details of the scheme have now been worked out, after a year's work by research officials Plentiful supplies of kelp could be collected from local beaches. Special machinery would be imported to process it.

By the end of the year South Africa will be making enough cement to be independent of imports, according to anticipations by the Department of Commerce and Industries. At present local production is 1,431,000 tons a year, and the balance of requirements, about 312,000 tons, has to be covered by imports. When the three new cement factories at Lichtenburg, Klerksdorp and Barkly West go into production after July they will deliver at the rate of 620,000 tons a year. The increased production will have a stimulating effect on housing and some industrial developments which have previously been handicapped by the scarcity. More than 60 factories are now engaged in the cement industry in addition to 40 or more lime works, which exist primarily to supply the cement factories.

* * *

Synthetic resin protective coatings against chemical attack for ships, steelwork and concrete are manufactured for the first time in South Africa by a firm recently established in Johannesburg under licence of American patentees. These coatings are based on such synthetic resins as phenolics, alkyds, vinyls, acrylics, etc., and the present range, which is being enlarged, includes lacquers for treating paper and quick-drying coatings.

* * *

The Union paint industry is lucky in having a local supply source for tung oil, as the nuts are grown and crushed in the Union. Nyasaland was also a producer of the oil, although the British Government has in the past few years competed for these supplies. The Nyasaland Tung Board is stated to have made big strides in increasing the quantity of its tung oil production and in the quality of these products.

* * *

A net profit of £1,003,034, compared with £926,252 for 1947, is shown in the accounts of African Explosives and Chemical Industries for the year ended September 30, 1948. Sales of explosives were maintained, and those of industrial chemicals have continued at a high level. Delivery of the plant for the Klipspruit cyanide factory was almost completed by the end of January this year, and the manufacture of calcium cyanide solution began there in the middle of February.

Home News Items

New Laboratories.—An extension to the chemical laboratories of Swansea University College is being planned.

Five-Day Week.—As from Monday, last week, the head office of Evans Medical Supplies, Ltd., Speke, Liverpool 19, has been working a five-day week, in common with all other establishments of the company.

Imports of Sperm Oil.—The Ministry of Food announces that the import of sperm oil, from certain sources, will be allowed under specific licence. This took effect on May 22. Applications for import licences should be made on Board of Trade form ILD/K to the Import Licensing Department, Board of Trade, 189 Regent Street, London, S.W.1.

Science and Productivity.—A review is to be made of the administrative arrangements by which the Government seek to ensure the maximum application of scientific knowledge to the solution of problems of productivity and economic development. Commander R. G. A. Jackson has been appointed to work with and report to Sir Ben Lockspeiser, secretary of the DSIR.

Factory Celebrations.—Soda ash was first produced at the Northwich factory of Brunner Mond—predecessor there of Imperial Chemical Industries, Ltd.—in May, 1874. To mark the 75th anniversary a party was given last week to employees, their families and friends. Celebrations were opened by Mrs W. F. Lutyens, wife of the director of I.C.I. Alkali Division, and some 17,000 adults and 6000 children attended.

Film in a Rubber Factory.—A "March of Time" film unit visited the Dunlop factory at Speke last week to record the use to which carbon black from U.S.A. is being put in making tyres. The film is one of a series designed to demonstrate to European countries how Marshall Aid is being applied. It will show the carbon black arriving in paper bags from the docks, being mixed in the rubber compound and tyres being made.

Clay Industries and Research.—The ninth national convention of the National Federation of Clay Industries was held in Edinburgh last week. Speaking at a civic reception in the Assembly Rooms, the Lord Provost referred to the merger of the British Refractories and British Pottery Research Associations, and said that new research laboratories were being built, which, when completed, would be the finest and largest in the world serving the clay and ceramic industries.

Coal Output Up.—With the return to work in Lancashire, coal production figures issued by the Ministry of Fuel and Power showed an estimated total of 4,371,300 tons last week, an increase of 308,000 tons.

Empire Mining Congress.—About 600 delegates and members representing 27 different countries will attend the fourth Empire Mining and Metallurgical Congress to be held in London and Oxford from July 9 to 23.

Chemicals Saved from Fire.—Night workers and firemen saved two vats of chemicals from a fire which broke out last Saturday at the Oakwood mills of the Textile Paper Tube Co., Romiley, Cheshire. The blaze is believed to have been caused by overheating of one of the impregnating ovens.

Shell's Australian Refinery.—A refinery costing £A.1.5 million is to be erected by the Shell Company of Australia on a 270-acre site at Geelong, Victoria, N.S.W. The enterprise, in Corio Bay, will have its own wharf for tankers and a railway siding and is part of a £A.12 million scheme by the company to provide a refinery in each Australian state.

Merseyside Chemicals.—The number of persons employed in chemical and allied trades in the Merseyside area has increased by 3100 between 1929 and 1947, according to the industrial survey based on research of the Lancashire Industrial Development Association. Local imports of chemicals were 97,618 tons in 1948, compared with 96,957 tons the previous year, and 109,821 tons in 1939. Exports have shown a steady increase—524,807 tons in 1948 against 517,649 tons in 1947 and 488,937 tons in 1939. The area surveyed includes Liverpool, Garston, Bootle, Burton, Birkenhead, Ellesmere Port, Hoylake Neston, New Ferry and Wallasey.

Scottish Universities. — Details of the eighth quinquennial distribution (1947-52) are given as an appendix to the 47th annual report of the Carnegie Trust for the Universities of Scotland. The distribution includes: St. Andrews centre: £5500 for scientific equipment, mainly for research. Glasgow centre: £70,000 to the University for the final portion of the Chemistry Institute, and £5500 for the Royal Technical College library. Aberdeen centre: £42,000 to the University towards the cost of a new chemistry department, and £5000 to the library. Edinburgh centre: £20,000 for a lectureship in phonetics at the University.

Overseas News Items

Alcohol Price Cut.—After achieving a sharp increase in production, Celanese Corporation of America has announced a substantial reduction in the price of normal propyl alcohol, amounting to 24 per cent or more in tank car quantities.

Uranium Occurrences in Spain.—The Spanish Ministry for Economics and Trade has recently published a report dealing with the country's uranium deposits, which are believed to be considerable. The report emphasises, however, that their exploitation would require foreign capital, machinery and equipment.

German Plastics Experts in Norway.—A number of experts of the former I.G. Farbenindustrie are reported to have gone to Norway to assist in the erection of a polyvinylchloride plant in Skien, scheduled to have an annual capacity of 1000 metric tons. Erection of this plant is the first step in the establishment of an industry in Norway.

Swedish Shale Oil.—The Swedish Minister of Trade has asked the Riksdag to allocate to the Swedish Shale Oil Company 3.75 million kronor in grants and 6 million kronor as a loan to expand operations. The whole shale oil production project is expected to cost 21.4 million kronor, of which 15 million kronor are loans. The plant is located at Kvarntorp in the province of Västergötland.

Tasmanian Aluminium Plant.—First plant for the aluminium industry to be set up by the Australian Commonwealth Government and Tasmanian State Government at Bell Bay, Northern Tasmania, has arrived from England. It weighs 1600 tons and consists of a section of a war-time aluminium industry from Gloucestershire. Surveys of the site, 40 miles from Launceston, have almost been completed, and layouts for the buildings are being prepared.

Tunisian Oil Exploitation.—The French Government and the Tunisian authorities have granted concessions enabling the Royal Dutch-Shell, the Gulf Oil Corporation and the French Corporation (Société des Recherches et Exploitations de Pétrole en Tunisie) to form a corporation for prospecting and exploiting Tunisia's oil wealth. The cost of the concession is estimated at $28 million for 14 years, and the cost of prospecting will be roughly $218 million over ten years. It is not likely that the production stage will be reached for several years even if the exploratory work should yield positive results.

Uranium in Argentina?—A Press report states that uranium has been found in the Argentine Poman Department of the Province of Catamarca by a Swedish engineer searching for mica. The Government of Argentina is to appoint a special commission to investigate the discovery.

Argentine Production of Sulphuric Acid.—In addition to plans already announced for expanded output in Argentina of sulphur and sulphuric acid, Meteror, S.A., a producer of electrolytic zinc in zerate announces that it expects to manufacture annually 18,000 metric tons of sulphuric acid from zinc-sulphide concentrates.

New Canadian Oxygen Plant.—The International Nickel Company has purchased equipment to produce 300 tons of oxygen daily in a factory being constructed at Copper Cliff, Canada. This unit is part of the company's $5 million project to utilise waste gases from smelting operations and to produce liquefied sulphur dioxide, states the U.S. Department of Commerce.

German Casein Plastic.—The first import since the war of 350 tons of casein within the field of the Marshall Plan has made it possible to resume the manufacture of the plastic material known as Galalith, the chief producer of which is the Internationale Galalith Gesellschaft, Hamburg/Harburg, which had a pre-war capacity of 250 tons per month of which one-half was exported.

New German Oilfields.—According to the British-licensed Berlin daily *Die Welt*, important discoveries of oil have recently been made in the territory between the River Ems, and the Netherlands frontier. Drillings have taken place at Ruehlertwist, north-west of Lingen, a few kilometres from the Dutch border. Drillings previously carried out at Bad Tölz were abandoned after a depth of 2205 metres had been reached.

Kenya Pyrethrum Position.—Although the U.S. Department of Agriculture is stated to have succeeded in synthesising the active principles of pyrethrum, the Pyrethrum Board of Kenya has recently stated that it is confident that this can have no adverse effect on the marketing of all pyrethrum flowers up to the end of March, 1951, and the board has recommended that existing growers whose labour conditions permit should increase their 1948 acreages by 25 per cent during the forthcoming rains. The board also intends to negotiate forward contracts in respect of the production period ending March 31, 1951.

Commercial Intelligence

The following are taken from the printed reports, but we cannot be responsible for errors that may occur.

Mortgages and Charges

(Note.—The Companies Consolidation Act of 1908 provides that every Mortgage or Charge, as described herein, shall be registered within 21 days after its creation, otherwise it shall be void against the liquidator and any creditor. The Act also provides that every company shall, in making its Annual Summary, specify the total amount of debt due from the company in respect of all Mortgages or Charges. The following Mortgages and Charges have been so registered. In each case the total debt, as specified in the last available Annual Summary, is also given—marked with an *—followed by the date of the Summary, but such total may have been reduced.)

ALBION SOAP CO., LTD., London, E. (M., 28/5/49.) April 19, £1000 debenture, to A. Coleman, Lancing; general charge. *Nil November 18, 1947.

CARBO-LIME, LTD., Gateshead. (M., 28/5/49.) April 13, debenture, to Olds Discount Co., Ltd., securing all money now or at any time owing by the company to the holder; general charge. *Nil. April 20, 1948.

MANCHESTER OIL REFINERY, LTD. (formerly REFINERY (HOLDINGS), LTD.), London, W. (M., 28/5/49.) April 13, £650,000 debenture stock secured by trust deed dated April 4, 1949; charge on specified properties at Davyhulme, etc., and general charge.

PETROLEUM INVENTIONS, LTD. (formerly PETROLEUM INVENTIONS & SPECIALITIES, LTD.), London, W. (M., 28/5/49.) April 13, charge securing debenture stock of Manchester Oil Refinery, Ltd., secured by a trust deed dated April 4, 1949, to the aggregate of the amount of the indebtedness for the time being of the company to Manchester Oil Refinery, Ltd.; general charge. *Nil. July 14, 1948.

Company News

The following increases in registered capital are announced: **Anglo Chemical Co. (Leicester), Ltd.,** from £10,000 to £20,000; **Associated Resin Products, Ltd.,** from £15,000 to £20,000; **Bioplastics, Ltd.,** from £50,000 to £58,500; **Bruton Engineering Co., Ltd.,** from £500 to £8000; **Cabot Carbon, Ltd.,** from £100 to £300,000; **Cloister Laboratories, Ltd.,** from £100 to £10,000; **Foaminol Laboratories, Ltd.,** from £4000 to £5000; **Guaranteed Sanitation, Ltd.,** from £100 to £1000; **Hempels Marine Paints, Co., Ltd.,** from £100 to £110,000; **Marchon Products, Ltd.,** from £1000 to £2000; **B. Noakes & Co., Ltd.,** from £50,000 to £60,000; **William W. Osgerby, Ltd.,** from £5000 to £10,000.

The name of **Grantley Chemicals, Ltd.,** 203 Regent Street, W.1, has been changed to Grantley Products, Ltd.

New Companies Registered

Asq-Kay & Co., Ltd. (468,466). Private company. Capital £4000. Manufacturers of turbines, winding engines, etc. Directors: V. Asquith, J. L. Kay. Reg. office: 27 Kingswood Avenue, High West Jesmond.

Chemical Pipe & Vessel Co., Ltd. (468,471). Private company. Capital £10,000. Manufacturers and workers of plastics, rubber, leather, vulcanite, chemicals, paints, etc. Directors: St. J. North, D. J. W. Boag, J. L. Hamilton, G. C. Tyce. Reg. office: 99 Fenchurch Street, E.C.3.

Chemrison, Ltd. (N.I.2672). Private company. Capital £10,000. Manufacturers of chemicals, solvents, heat resisting cement, etc. Subscribers: R. Green, Donegall Square South, Belfast, and K. Montgomery.

H. F. Dusart, Ltd. (468,110). Private company. Capital £5000. Manufacturing chemists, etc. Directors: H. F. Dusart, A. E. Lambert. Reg. office: 84 High Street, Lewes.

Engineering & Chemical Supplies, Ltd. (468,144). Private company. Capital £500. Subscribers: Jean A. Barnard, 69 Moorgate, E.C.2, and Eileen K. Wyatt. Director: Naji Ibroshim.

Hay & Elder, Ltd. (468,107). Private company. Capital £100. Objects: To acquire patents, to carry on the business of manufacturers' agents for the import, export, and sale of plastics and synthetic materials, chemicals, metals, etc. Directors: Mrs. E. Hay, Mrs. V. B. Elder. Reg. office: 116 Victoria Street, S.W.1.

H. Neville (Chemist), Ltd. (467,324). Private company. Capital £2000. Manufacturing chemists, etc. Directors: H. Neville, 3 Mostyn Street, Llandudno, and G. Neville.

Yan San, Ltd. (468,129). Private company. Capital £2000. Manufacturing chemists, etc. Directors: J. Hoyle, H. R. Waring. Reg. office: Yan San House, 21 Peel Street, Accrington.

Chemical and Allied Stocks and Shares

MARKETS have been inactive, awaiting the next developments in international affairs. British Funds eased, sentiment reflecting the discount shown in the new Malaya loan, while latest export trade news affected industrial shares. Moreover, there is a disposition to await the Labour Party's Whitsun conference.

The Imperial Chemical Industries annual meeting on Tuesday continued to be

awaited with particular interest because it is expected in the City that Lord McGowan will make a spirited reply to the nationalisation threat.

Imperial Chemical at 46s. 10½d. have eased slightly, and most chemical and allied shares receded a little in accordance with the prevailing market trend. Fisons were 47s. 6d., Albright and Wilson 29s. 9d., Amber Chemical 2s. shares 6s. 9d., Boake Roberts 5s. shares 30s. 6d. and Bowman Chemical 4s. ordinary 7s. Elsewhere, Brotherton 10s. shares have been firm at 20s. 10½d. Monsanto Chemical new shares were 1s. 3d. over the issue price of 52s. 6d. In other directions, L. B. Holliday 4¼ per cent preference were 22s. 7½d. and British Chemical and Biologicals 4 per cent preference 20s. 9d.

On the other hand, shares of companies with interests in plastics remained out of favour, with British Xylonite at 75s. at which there is a yield of rather more than 5¼ per cent on the basis of last year's 20 per cent dividend, De La Rue were 34s. 3d. awaiting the full results, and British Industrial Plastics 2s. shares 5s., at which the yield is 7⅞ per cent, last year's dividend having been 20 per cent.

British Glues and Chemicals were steady at 19s. 9d., Borax Consolidated changed hands around 53s. 6d., British Aluminium were 47s. 6d. but pending terms of the big new issue, British Oxygen came back to 96s. 10½d. Dunlop Rubber eased to 65s. 3d. despite the good impression created by the full results, which show that the past year's expansion in profits to a record level was due largely to increased sales and business overseas. Lever and Unilever came back sharply to 47s. 3d. partly because of switching into Lever N.V. which strengthened to 43s. 10½d.

Associated Cement receded to 80s. 9d., profit-taking following declaration of the higher dividend. British Portland Cement were back to 83s. 9d., Tunnel Cement 49s., while elsewhere, British Plaster Board receded to 22s. Units of the Distillers Co. lost a few pence at 27s. Paint shares have not recovered from the decision of Fleetwood Paints not to pay a dividend. Shares of the latter were 1s. 6d., Pinchin Johnson 44s and Lewis Berger 4s. units 26s. 10½d. Blythe Colour fell to 37s. 6d. United Molasses were marked down sharply to 44s. 3d. on the directors' decision to postpone the share bonus because of the cost of new tankers and the uncertain outlook. Among other bonus shares, Glaxo Laboratories were active, changing hands around £22¼.

Boots Drug at 54s. 6d. have been relatively steady, awaiting the financial results, which the market expects will create a good impression. British Drug Houses 5s. shares were 7s. 6d. Oils have been uncertain, with Shell easing to 65s. 7½d. Although the Shell dividend is unchanged at 7½ per cent, tax free, the company's net profits have risen by £453,198 to £4,377,490. The preliminary figures give for the first time combined earnings of the Royal Dutch-Shell group, estimated at £44,565,000, a very large proportion of which is retained or allocated to the reserves.

J. R. Geigy Capital Issue

The board of the J. R. Geigy A.G., Basle, the Swiss parent company of the chemical and pharmaceutical group which has subsidiaries in this country, France, Italy, Spain, Portugal, the U.S.A., and Argentina, has just turned to the Swiss capital market for a 3½ per cent loan of 12 million francs, repayable not later than 1959. The loan is being publicly placed by a Swiss banking syndicate and is being issued at 99.4 per cent.

The prospectus affords facts about the company's financial position which have not hitherto been available. The balance sheet, drawn up at the end of 1948, shows the company's assets at nominal values only, but their magnitude, as shown at the end of 1948, may be gauged from the fact that factories and administrative buildings are stated to represent an insurance value of 19,499,500 francs, while the corresponding figure for machinery and equipment is 20,666,865 francs. Stocks appear as 15.08 million francs. Subsidiary companies and other participations amount to almost 37.5 million francs of which 23.63 million is attributed to the Geigy works, Schweizerhalle, the most important unit of the group. The latest net profit totals 2,170,127 francs and the board recommends a dividend of 12 per cent (same) on the share capital of 15 million francs.

I. G. Farben's Swedish Interests

It is reported from Sweden that arrangements for the liquidation of the A/B Anilinkompaniet have been completed. The company's share capital of 100,000 crowns has been in Swedish hands, although a special option right put it *de facto* at the disposal of the I. G. Farbenindustrie. The German group shipped to the A/B Anilinkompaniet a large stock which made it possible to maintain sales during the war at a remarkably high level. In fact, the value of these stocks is said to have originally amounted to 10 million crowns.

Prices of British Chemical Products

STEADY price conditions continue to be maintained in nearly all sections of the chemicals market, a notable exception being the non-ferrous metal compounds. Lower quotations for red and white leads were notified in these columns last week and similar reductions are expected elsewhere following the decline in non-ferrous metal prices. Buying both for home and export remains more or less at recent levels as regards volume, while the movement to the chief industrial consuming industries against contract commitments is reported to be of satisfactory dimensions. Supply difficulties among the soda products have very much receded, and this is also true to a less extent in the potash chemicals section. Lower quotations for potassium permanganate have been notified by the makers and all grades are reported to be in steady request. Quiet conditions prevail in the coal-tar products market but prices remain unchanged.

MANCHESTER.—Steady pressure for deliveries of alkali and other heavy chemical products from the cotton textile and allied industries has been reported in Manchester market during the past week. The demand for soda ash from the woollen and glass industries has also been brisk and a fair amount of new business has been placed by other industrial users in a wide range of general chemicals. Shippers' inquiries in connection with overseas transactions have continued on steady lines. Buying interest in the tar products has remained patchy, and while there is a fair demand for carbolic acid and most of the light products, not very much new business has been reported in several other lines, including cresylic acid.

GLASGOW.—The demand for toluol and xylol in the Scottish chemical market has shown an increase during the past week. Other coal tar products have also been in heavy demand. There have been no changes in prices, and the supply position of the majority of chemicals is good; the main exception being sodium chlorate, of which supplies have been far from sufficient. The demand for insecticides and certain types of disinfectants has also been heavy. The export market has continued to be quiet.

Price Changes

Rises: Sodium sulphate, sunflower acid oil.
Reductions: Copper carbonate, lead nitrate, red lead, white lead, potassium permanganate, salicylic acid, pyridine, castor oil, linseed oil.

General Chemicals

Acetic Acid.—Maximum prices per ton: 80% technical, 1 ton, £64; 80% pure, 1 ton, £66; commercial glacial 1 ton £79; delivered buyers' premises in returnable barrels: £4 10s. per ton extra; in glass carboys, £7; demijohns, £11.

Acetic Anhydride.—Ton lots, d/d, 11$\frac{3}{4}$d. per lb.

Acetone.—Small lots: 5 gal. drums, £90 per ton; 10 gal. drums, £85 per ton. In 40/45 gal. drums less than 1 ton, £70 per ton; 1 to 9 tons, £69 per ton; 10 to 50 tons, £68 per ton; 50 tons and over £67 per ton.

Alcohol, Industrial Absolute.—50,000 gal. lots, d/d, 2s. 7$\frac{7}{8}$d. per proof gallon; 5000 gal. lots, d/d, 2s. 10$\frac{7}{8}$d. per proof gal.

Alcohol, diacetone.—Small lots: 5 gal. drums, £133 per ton; 10 gal. drums, £128 per ton. In 40/45 gal. drums: less than 1 ton, £113 per ton; 1 to 9 tons, £112 per ton; 10 to 50 tons, £111 per ton; 50 to 100 tons, £110 per ton; 100 tons and over, £109 per ton.

Alum.—Loose lump, £17 per ton, f.o.r. MANCHESTER: Ground, £17 10s.

Aluminium Sulphate.—Ex works, £11 10s. per ton d/d. MANCHESTER: £11 10s.

Ammonia, Anhydrous.—1s. 9d. to 2s. 3d. per lb.

Ammonium Bicarbonate.—2 cwt. non-returnable drums; 1 ton lots, £40 per ton.

Ammonium Carbonate.—1 ton lots; lump £52 10s., ground £55 10s. per ton d/d in 5-cwt. casks. MANCHESTER: Powder, £50 d/d.

Ammonium Chloride. — Grey galvanising, £22 10s. per ton, in casks, ex wharf. Fine white 98%, £21 to £25 per ton. See also Salammoniac.

Ammonium Nitrate.—D/d, £18 to £20 per ton.

Ammonium Persulphate.—MANCHESTER: £5 per cwt. d/d.

Ammonium Phosphate.—Mono- and di-, ton lots, d/d, £78 and £76 10s. per ton.

Antimony Oxide.—£162 10s. per ton.

Antimony Sulphide.—Golden, d/d, as to quantity, etc., 4s. to 5s. per lb.

Arsenic.—Per ton, £40 5s. to £41 5s., according to quality, ex store.

Barium Carbonate.—Precip., d/d; 2-ton lots, £25 15s. per ton, bag packing, ex works.

Barium Chloride.—£35 to £35 10s. per ton.

Barium Sulphate (Dry Blanc Fixe).—Precip., 4-ton lots, £26 10s. per ton d/d; 2-ton lots, £26 15s. per ton.

Bleaching Powder. Spot, 35/37%, £18 10s. per ton in casks (1 ton lots).

Borax.—Per ton for ton lots, in free 1-cwt. bags, carriage paid: Commercial, granulated, £27 10s.; powdered, £30; extra fine powder, £31; B.P., crystals, £39; powdered, £39 10s.; extra fine, £40 10s. Borax glass, per ton in free 1-cwt. waterproof paper-lined bags, for home trade only, carriage paid: lump, £77; powdered, £78.

Boric Acid.—Per ton for ton lots in free 1-cwt. bags, carriage paid: Commercial, granulated, £48; crystals, £53; powdered, £51-£53; extra fine powder, £53. B.P., crystals, £61; powder, £62; extra fine, £64; anhydrous borax, dehydrated borax, £48 per 140 lb. net.

Calcium Bisulphide.—£6 10s. to £7 10s. per ton f.o.r. London.

Calcium Chloride.—70/72% solid, £8 12s. 6d. per ton, in 4 ton lots.

Charcoal, Lump.—£25 per ton, ex wharf. Granulated, £30 per ton.

Chlorine, Liquid.—£28 per ton d/d in 16/17-cwt. drums (3-drum lots).

Chrometan.—Crystals, 5⅝d. per lb.

Chromic Acid.—1s. 10d. to 1s. 11d. per lb., less 2½%, d/d U.K.

Citric Acid.—Controlled prices per lb., d/d buyers' premises. For 5 cwt. or over, anhydrous, 1s. 6¾d., other, 1s. 5.; 1 to 5 cwt., anhydrous, 1s. 9d., other, 1s. 7d. Higher prices for smaller quantities.

Cobalt Oxide.—Black, delivered, 7s. 7½d. per lb.

Copper Carbonate.—MANCHESTER: 1s. 5½d. per lb.

Copper Chloride.—(53 per cent), d/d, 1s. 10½d. per lb.

Copper Oxide.—Black, powdered, about 1s. 4½d. per lb.

Copper Nitrate.—(53 per cent), d/d, 1s. 8½d. per lb.

Copper Sulphate.—£42 10s. per ton f.o.b., less 2%, in 2-cwt. bags.

Cream of Tartar.—100%, per cwt., about £7 8s. per 1-2 cwt. lot, d/d.

Ethyl Acetate.—10 tons and upwards, d/d, £115 per ton.

Formaldehyde.—£31 per ton in casks, according to quantity, d/d. MANCHESTER: £32.

Formic Acid.—85%, £64 per ton for ton lots, carriage paid. 90%, £67 5s. per ton.

Glycerine.—Chemically pure, double distilled 1260 s.g. £123 per cwt. Refined pale straw industrial, 5s. per cwt. less than chemically pure.

Hexamine.—Technical grade for commercial purposes, about 1s. 4d. per lb.; free-running crystals are quoted at 2s. 1d. to 2s. 3d. per lb.; carriage paid for bulk lots.

Hydrochloric Acid.—Spot, 7s. 6d to 8s 9d. per carboy d/d, according to purity, strength and locality.

Hydrofluoric Acid.—59/60%, about 1s. to 1s. 2d. per lb.

Hydrogen Peroxide.—1s. 0½d. per lb. d/d, carboys extra and returnable.

Iodine.—Resublimed B.P., 10s. 4d. to 14s. 6d. per lb., according to quantity.

Iron Sulphate.—F.o.r. works, £3 15s. to £4 per ton.

Lactic Acid.—Pale, tech., £80 per ton; dark tech., £70 per ton ex works; barrels returnable.

Lead Acetate.—White, 120s. to 122s. per cwt

Lead Carbonate.—British dry, ton lots, d/d, £131 per ton.

Lead Nitrate.—About £116 per ton d/d in casks. MANCHESTER: £110.

Lead, Red.—Basic prices per ton: Genuine dry red lead, £111; orange lead, £123. Ground in oil: red, £134; orange, £146. Ready-mixed lead paint: red, lots of 20 gals. and under 160 gals. in 1 gal. tins uncrated, £2 5s. per gal.; orange, 3s. 6d. per gal. extra over the price for red.

Lead, White.—Dry English, in 8-cwt. casks, £121 per ton. Ground in oil, English, 50-100 tons lots, £133 per ton.

Lime Acetate.—Brown, ton lots, d/d, £18 to £20 per ton; grey, 80-82 per cent, ton lots, d/d, £22 to £25 per ton.

Litharge.—£121 10s. per ton.

Lithium Carbonate.—7s. 9d. per lb. net.

Magnesite.—Calcined, in bags, ex works, £18 5s.

Magnesium Carbonate.—Light, commercial, d/d, £70 per ton.

Magnesium Chloride.—Solid (ex wharf), £27 10s. per ton.

Magnesium Oxide.—Light, commercial, d/d, £160 per ton.

Magnesium Sulphate.—£12 to £14 per ton.

Mercuric Chloride.—Per lb., lump, 7s. 4d.; smaller quantities dearer.

Mercurous Chloride.—8s. to 9s. per lb., according to quantity.

Mercury Sulphide, Red.—Per lb., from 10s. 3d. for ton lots and over to 10s. 7d. for lots of 7 to under 30 lb.

Methanol.—Pure synthetic, d/d, £28 to £38 per ton.

Methylated Spirit.—Industrial 66° O.P. 100 gals., 4s. 8d. per gal.; pyridinised 64° O.P. 100 gal., 4s. 11d. per gal.

Nickel Sulphate.—F.o.r. works, 3s. 4d. per lb.

Nitric Acid.—£24 to £26 per ton, ex works.

Oxalic Acid.—£128 to £133 per ton packed in free 5-cwt. casks.

Paraffin Wax.—Nominal.

Phosphoric Acid.—Technical (S.G. 1.500), ton lots, carriage paid, £61 per ton; B.P. (S.G.1.750), ton lots, carriage paid, 1s. 1d. per lb.

Phosphorus.—Red, 3s. per lb. d/d; yellow, 1s. 10d. per lb. d/d.

Potash, Caustic.—Solid, £65 10s. per ton for 1-ton lots; flake, £76 per ton for 1-ton lots. Liquid, d/d, nominal.

Potassium Bichromate. — Crystals and granular, 9⅝d. per lb.; ground, 10⅝d. per lb., for not less than 6 cwt.; 1-cwt. lots, ½d. per lb. extra.

Potassium Carbonate.—Calcined, 98/100%, £64 per ton for 1-ton lots, ex store; hydrated, £58 for 1-ton lots.

Potassium Chlorate.—Imported powder and crystals, nominal.

Potassium Chloride.—Industrial, 96 per cent, 6-ton lots, £16.10 per ton.

Potassium Iodide.—B.P., 11s. 1d. to 12s. per lb., according to quantity.

Potassium Nitrate.—Small granular crystals, 76s. per cwt. ex store, according to quantity.

Potassium Permanganate.—B.P., 1s. 7½d. per lb. for 1-cwt. lots; for 3 cwt. and upwards, 1s. 6d. per lb.; technical, £7 9s. 6d. to £8 3s. 0d. per cwt.; according to quantity d/d.

Potassium Prussiate.—Yellow, nominal.

Salammoniac.—First lump, spot, £48 per ton; dog-tooth crystals, £50 per ton; medium, £48 10s. per ton; fine white crystals, £21 to £25 per ton, in casks, ex store.

Salicylic Acid.—MANCHESTER: 1s. 11d. to 3s per lb. d/d.

Soda Ash.—58° ex depôt or d/d, London station, £7 12s. 6d. to £8 7s. 6d. per ton.

Soda, Caustic. — Solid 76/77%; spot, £19 per ton d/d.

Sodium Acetate.—£41-£55 per ton.

Sodium Bicarbonate.—Refined, spot, £11 10s. per ton, in bags.

Sodium Bichromate.—Crystals, cake and powder, 8d. per lb.; anhydrous, 7¼d. per lb., net, d/d U.K. in 7-8 cwt. casks.

Sodium Bisulphite. — Powder, 60/62%, £28 7s. 6d. per ton d/d in 2 ton lots for home trade.

Sodium Carbonate Monohydrate.—£25 per ton d/d in minimum ton lots in 2-cwt. free bags.

Sodium Chlorate.—£52 to £57 per ton.

Sodium Cyanide.—100 per cent basis, 8d. to 9d. per lb.

Sodium Fluoride.—D/d, £4 10s. per cwt.

Sodium Hyposulphite.—Pea crystals 22s. 6d. per cwt. (2-ton lots); commercial, 1-ton lots, £16 per ton carriage paid. Packing free.

Sodium Iodide.—B.P., 10s. 2d. per lb. to 12s. 1d. according to quantity.

Sodium Metaphosphate (Calgon).—Flaked, loose in metal drums, £103 ton.

Sodium Metasilicate.—£19 to £19 5s. per ton, d/d U.K. in ton lots.

Sodium Nitrate.—Chilean Industrial, 97-98 per cent, 6-ton lots, d/d station, £20 10s. per ton.

Sodium Nitrite.—£29 10s. per ton.

Sodium Percarbonate.—12½% available oxygen, £7 per cwt. in 1-cwt. drums.

Sodium Phosphate.—Di-sodium, £32 10s. per ton d/d for ton lots. Tri-sodium, £62 per ton d/d for ton lots.

Sodium Prussiate.—9d. to 9½d. per lb. ex store.

Sodium Silicate.—£6 to £11 per ton.

Sodium Silicofluoride.—Ex store, nominal.

Sodium Sulphate (Glauber Salt).—£8 per ton d/d.

Sodium Sulphate (Salt Cake).—Unground. £6 per ton d/d station in bulk. MANCHESTER: £6 10s. per ton d/d station.

Sodium Sulphide. — Solid, 60/62%, spot. £23 per ton, d/d, in drums; broken, £23 15s. per ton, d/d, in casks.

Sodium Sulphite.—Anhydrous, £29 10s. per ton; pea crystals, £20 10s. per ton d/d station in kegs; commercial, £12 to £14 per ton d/d station in bags.

Sulphur.—Per ton for 4 tons or more, ground, £14 12s. 6d. to £16 17s. 6d., according to fineness.

Sulphuric Acid.—168° Tw., £6 10s. to £7 10s. per ton; 140° Tw., arsenic free £5 2s. 6d. per ton; 140° Tw., arsenious, £4 15s. per ton. Quotations naked at sellers' works.

Tartaric Acid.—Per cwt: 10 cwt. or more £9; 5 to 9 cwt. £9 2s.; 2 to 4 cwt. £9 4s.; 1 cwt. £9 6s.

Tin Oxide.—1-cwt. lots d/d £25 10s.

Titanium Oxide.—Comm., ton lots, d/d, (56 lb. bags), £102 per ton.

Zinc Oxide.—Maximum prices per ton for 2-ton lots, d/d; white seal, £97 15s.; green seal, £96 15s.; red seal, £95 5s.

Zinc Sulphate.—£31 per ton.

Rubber Chemicals

Antimony Sulphide.—Golden, 4s. to 5s. per lb. Crimson, 2s. 7½d. to 3s. per lb.

Arsenic Sulphide.—Yellow, 1s. 9d. per lb.

Barytes.—Best white bleached, £8 3s. 6d. per ton.

Cadmium Sulphide.—6s. to 6s. 6d. per lb.

Carbon Bisulphide.—£37 to £41 per ton, according to quality, in free returnable drums.

Carbon Black.—6d. to 8d. per lb., according to packing.

Carbon Tetrachloride.—£56 to £59 per ton, according to quantity.

Chromium Oxide.—Green, 2s. per lb.

India-rubber Substitutes.—White, 10 5/16d. to 1s. 5¾d. per lb.; dark, 10¼d. to 1s. per lb.

Lithopone.—30%, £36 15s. per ton.

Mineral Black.—£7 10s. to £10 per ton.

Mineral Rubber, "Rupron."—£20 per ton.

Sulphur Chloride.—7d. per lb.

Vegetable Lamp Black.—£49 per ton.

Vermillion.—Pale or deep, 15s. 6d. per lb. for 7-lb. lots.

Nitrogen Fertilisers

Ammonium Phosphate.—Not quoted—temporarily unobtainable.

Ammonium Sulphate.—Per ton in 6-ton lots, d/d farmer's nearest station, in January, £10 6s. 6d., rising by 1s. 6d. per ton per month to March, 1949.

Calcium Cyanamide.—Nominal; supplies very scanty.

Compound Fertilisers.—Per ton d/d farmer's nearest station, I.C.I. No. 1 grade, where available, £10 14s. 6d. I.C.I. Special No. 1, £16 13s. 6d. per ton per month to June, 1949.

"Nitro-Chalk."—£10 4s. per ton in 6-ton lots, d/d farmer's nearest station.

Sodium Nitrate.—Chilean for 6-ton lots d/d nearest station, £11 per ton.

Coal-Tar Products

Benzol.—Per gal. ex works: 90's, 2s. 6d.; pure, 2s. 8¼d.; nitration grade, 2s. 10½d.

Carbolic Acid. — Crystals, 11½d per lb. Crude, 60's, 4s. 3d. MANCHESTER: Crystals, 10¾d. to 1s. 0¼d. per lb., d/d crude, 4s. 3d., naked, at works.

Creosote.—Home trade, 6¼d. to 9¾d. per gal., according to quality, f.o.r. maker's works. MANCHESTER: 6¼d. to 9¾d. per gal.

Cresylic Acid.—Pale, 98%, 3s. 9d per gal.; 99%, 4s. 2d.; 99.5/100%, 4s. 4d. American, duty free, 4s. 2d., naked at works. MANCHESTER: Pale, 99/100%, 4s. 4d. per gal.

Naphtha.—Solvent, 90/160°, 2s. 10d. per gal. for 1000-gal. lots; heavy, 90/190°, 2s. 4d. per gal. for 1000-gal. lots, d/d. Drums extra; higher prices for smaller lots. Controlled prices.

Naphthalene.—Crude, ton lots, in sellers' bags, £8 1s. to £12 13s. per ton according to m.p.; hot-pressed, £14 15s. to £15 14s. per ton, in bulk ex works; purified crystals, £28 to £43 5s. per ton. Controlled prices.

Pitch.—Medium, soft, home trade, 100s. per ton f.o.r. suppliers' works; export trade, £8 5s. to £9 5s. per ton f.o.b. suppliers' port. MANCHESTER: 100s. f.o.r.

Pyridine.—90/140°, 21s. 6d. to 22s. 6d. per gal.; 90/160°, 19s. MANCHESTER: 19s. to 22s. 6d. per gal.

Toluol.—Pure, 3s. 2½d. per gal.; 90's, 2s. 4d. per gal. MANCHESTER: Pure, 3s. 2½d. per gal. naked.

Xylol.—For 1000-gal. lots, 3s. 3½d. to 3s. 6d. per gal., according to grade, d/d.

Wood Distillation Products

Calcium Acetate.—Brown, £15 per ton; grey, £22.

Methyl Acetone.—40/50%, £56 to £60 per ton.

Wood Creosote.—Unrefined, from 3s. 6d. per gal., according to boiling range.

Wood Naphtha.—Miscible, 4s. 6d to 5s. 6d. per gal.; solvent, 5s. 6d. to 6s. 6d. per gal.

Wood Tar.—£6 to £10 per ton.

Intermediates and Dyes (Prices Nominal)

***m*-Cresol** 98/100%.—Nominal.

***o*-Cresol** 30/31° C.—Nominal.

***p*-Cresol** 34/35° C.—Nominal.

Dichloraniline.—2s. 8½d. per lb.

Dinitrobenzene.—8½d. per lb.

Dinitrotoluene.—48/50° C., 9½d. per lb.; 66/68 C., 1s.

***p*-Nitraniline.**—2s. 5d. per lb

Nitrobenzene.—Spot, 5½d. per lb. in 90-gal. drums, drums extra, 1-ton lots d/d buyers' works.

Nitronaphthalene.—1s. 2d. per lb.; P.G. 1s. 0½d. per lb.

***o*-Toluidine.**—1s. per lb., in 8/10-cwt. drums, drums extra.

***p*-Toluidine.**—2s. 2d. per lb., in casks.

***m*-Xylidine Acetate.**—4s. 5d. per lb., 100%.

Latest Oil Prices

LONDON.—May 28.—For the period ending June 4, 1949, for unrefined oils (July 16 for refined oils). Per ton, naked *ex* mill, works or refinery, and subject to additional charges according to package; LINSEED OIL, crude, £150; roots, £100. CASTOR OIL, crude firsts, £122; crude seconds, £115. COCONUT OIL, crude, £106; refined deodorised, £112; refined hardened deodorised, £116. RAPESEED OIL, crude, £190. PALM KERNEL OIL, crude, £105 10s.; refined deodorised, £112; refined hardened deodorised, £116. PALM OIL (per ton c.i.f.), in returnable casks, £99 5s.; in drums on loan, £98 15s.; in bulk, £97 15s. GROUNDNUT OIL, crude, £110 10s.; refined deodorised, £114; refined hardened deodorised, 40°, £118. WHALE OIL, blubber, £60. ACID OILS, groundnut, £94; soya, £92; sunflower, £92; coconut and palm-kernel, £97 10s. ROSIN: wood, 24s. to 58s.; gum, 51s. 6d. to 59s. 6d. per cwt., *ex* store, according to grade. TURPENTINE, American, 74s. per cwt.; Portuguese, 64s. per cwt. in drums or barrels, as imported (controlled price).

CLASSIFIED ADVERTISEMENTS

FOR SALE

GEORGE 600 COHEN'S

BUELL (Buttner System) **ROTARY DRYING PLANT,** comprising rotary drier, 34 ft. 6 in. long by 6 ft. 11 in. diam., constructed ⅜ in. mild steel plate with discharge equipment, fan, dust separator system, screw and drag-link conveyors, bucket elevators, but excluding electrical equipment.

FILTER PRESS by Johnson, recessed plate type, 69 cast-iron plates, 40 in. by 40 in., forming cakes 37½ in. by 37½ in. by ¾ in. thick approximately, pyramid surfaces, centre feed, 3½ in. diam., with Johnson double-acting pump, 2½ in. diam. by 6 in. stroke, arranged fast and loose pulley drive.

Two—Unused Vertical **CANNING RETORTS** by Frazer of Millwall, 3 ft. diam. by 6 in. deep, ¼ in. mild steel plate construction, welded; domed cover secured by eight 1¼ in. diam. swing bolts. Suitable for 35 lb. w.p.

Two—30-gallon capacity Steam-jacketed **TILTING TYPE PANS** by Brierley Collier & Hartley, stainless steel liner with cast-iron jacket; working pressure, 81 lb.

Four—Horizontal **CYLINDRICAL GLASS-LINED STORAGE TANKS** by Pfaudler, each approximately 1,800 gallons capacity.

Five—Unused Single Trough **POWDER OR LIQUID MIXERS** of continental manufacture, mild steel, troughs approximately 8 ft. 6 in. by 3 ft. by 3 ft. 3 in. deep, ribbon type agitators on square shaft. Arranged for direct drive. No motors.

Two—Oval-section **WATER-JACKETED MIXERS** by Joseph Baker, internal dimensions, 5 ft. 10 in. long by 4 ft. 2 in. wide by 4 ft. 3 in. deep, twin vertical agitator shafts, 2 in. diam. bottom side outlet.

Five—**PEERLESS WHISKS or MIXERS,** 80 qt. capacity. Single high-speed type. Direct driven from 5 h.p. motor, 400/3/50. New tinned pans, 20 in. diam., various whisks, beaters, etc.

MIXER/DRIER by Simon. Horizontal unjacketed trough type, internal dimensions approximately 8 ft. long by 2 ft. 6 in. deep by 2 ft. 8 in. wide. Agitator bank of 16 solid-drawn tubes approximately 6 ft. 6 in. long by 2⅝ in. o.d., 8 in. sq. bottom side discharge. Bottom half of mixer removable.

Several—**COMPOUND BALL/TUBE MILLS** by Johnson. Dimensions approximately 12 ft. long by 3 ft. 6 in. diam., arranged for belt drive through gearing. Complete with charge of flint and steel balls.

Size 7 **DUPLEX MIXING AND KNEADING MACHINE** by Morton of Wishaw. Steam-jacketed trough approximately 42 in. by 38 in. by 30 in., working capacity, 115 gals. Double Naben type twin gunmetal mixing blades. Internal working pressure, 15 lb. ps.i. or high vacuum. Power-operated tilting.

GEORGE COHEN SONS & CO. LTD.,
SUNBEAM ROAD, LONDON, N.W.10.
Tel.: Elgar 722, and
STANNINGLEY, Nr. LEEDS.
Tel.: Pudsey 2241.

ACCURATE Powders for Ceramic, Alloy, Plastic, Paint, etc., industries. DOHM LTD., Pulverisers, 167, Victoria Street, London, S.W.1.

BORIC Acid, granulated, in 1 cwt. sacks. £1 per sack, carriage extra.
Autoclave 30 in. by 30 in. with stirring gear, £15.
Four Elliott Tollemache Bin Level Transmitters.
Flameproof Lamps, Switches, Fuses.
Jones, 29, Station Road, Port Talbot.

CHARCOAL, ANIMAL and VEGETABLE, horticultural, burning, filtering, disinfecting, medicinal, insulating; also lumps ground and granulated; established 1830; contractors to H.M. Government.—THOS. HILL-JONES, LTD., "Invicta" Mills, Bow Common Lane, London, E. Telegrams, "Hilljones, Bochurch, London." Telephone: 3285 East.

FOR SALE

MORTON, SON & WARD LIMITED,
—OFFER—
SPECIALISED CHEMICAL PLANT

ONE—Mild Steel Autoclave or Curing Pan, 3 ft. 3 in. diam. by 4 ft. 9 in. deep by $\frac{7}{16}$ in. riveted plate, with hinged cover secured by 16 swing bolts. 60 lb. per sq. in. working pressure. (Unused.)

ONE—New "Morward" Powder Mixer with trough 6 ft. long by 2 ft. wide by 2 ft. deep. driven through fan-cooled gearbox from 6 h.p. motor, 400/3/50 cycles, complete with starter.

ONE—Unused Gardner "Rapid" Steam-jacketed Mixer and Drier, 6 ft. long by 2 ft. 3 in. wide by 2 ft. 6 in. deep, gear wheel and pinion drive from fast and loose pulleys.

ONE—Similar machine by George Porteous.

SIX—3 in. Regulus Metal Acid Valves, straight-through pattern, standard flanges, stainless steel fittings.

TWO—2 in. Ditto.

FOUR—New 40-gal. Open-top Steam-jacketed Welded Mild Steel Mixing Pans, 2 ft. diam. by 2 ft. deep, 50 lb. per sq. in. working pressure. Overdriven stirring gear. Fast and loose pulleys.

THREE—New 200-gal Unjacketed Mixing Pans, 3 ft. diam. by 4 ft. 6 in. deep, overdriven stirring gear. Fast and loose pulleys.

MORTON, SON & WARD LIMITED,
WALK MILL, DOBCROSS, Nr. OLDHAM.
'Phone: Saddleworth 437.

GARDNER RAPID MIXER, 8 ft. by 2 ft. 6 in., stainless steel spiral blades, complete with cover and water spray inlet, motorised through Radicon reduction gear by 400/3/50 10 h.p. motor and starter. Exc. cond. GARDNER RAPID CRUSHER/SIFTER. Crusher hopper fed, bronze rolls, sifter, brush type, 8 in. diam. by 14 in. long with shutter discharge. Fast and loose pulley drive. Box No. 2812, THE CHEMICAL AGE, 154, Fleet Street, London, E.C.4.

GOVERNMENT unused 36-in. diam. Ventilating Wall Fans, ball bearing, V pulley drive, £3 each nett ex-works. THOMPSON & SON (MILLWALL) LTD., Cuba Street, London, E.14.

CONVEYOR BELTING FOR IMMEDIATE DELIVERY

HIGH-GRADE heavy quality Belting, 5-ply canvas, with ⅛ in. top and $\frac{1}{16}$ in. underside rubber covering. Considerable quantity available in continuous lengths of approximately 100 ft. and over.
24 in. wide Belting, 16/- per foot.
20 in. wide Belting, 14/- per foot.
18 in. wide Belting, 13/- per foot.
Typical samples of any width sent on application.
MORTON, SON & WARD LIMITED,
WALK MILL, DOBCROSS, Nr. OLDHAM,
'Phone – Saddleworth 437.

CASKS, BARRELS, KEGS

(NEW, RE-MADE, OR RE-COOPERED)

For Home or Export Packing of Drygoods, Powders, Foodstuffs, Dry Chemicals, Pastes, etc.

Prompt and regular supplies of all sizes from 5 up to 45 gallon capacity.

Delivered prices to all parts.

JAMES GREIG LIMITED,

COOPERS,

VIRGIL STREET, LIVERPOOL, 5

FOR SALE

POWERFUL Bleach, Sodium Persulphate and Soda Ash 50/50% 8 tons for sale to best offer. Box No. 2815, THE CHEMICAL AGE, 154, Fleet Street, London, E.C.4.

ROTARY Tablet Machine.
Punches and Dies.
Oscillating Granulator.
Granulating Mixer.
(All unused)
Box No. 2814, THE CHEMICAL AGE, 154, Fleet Street, London, E.C.4.

SEVERAL small steam-jacketed Copper Pans.
Several Ball Mills, 6 ft. 6 in. by 6 ft. 8 in., Silex-lined batch type, with driving gear and clutch.
8 Simon type Portable Slat Conveyors, 20 ft. long, for boxes or bags.
Mixing Pan, 6 ft. dia. by 5 ft. deep, flat bottom, open top.
Ditto, 3 ft. dia. by 5 ft. deep, flat bottom, open top.
2—6 in. Centrifugal Pumps by Cherry.
Milton Grinders fitted with 30 in. vertical stones, belt driven with shaker feeds.
1 Iwel 20 in. Turbine Centrifugal Extractors with spare baskets.
Steam Jacketed Gardner pattern Mixer about 30 gallons capacity.
4 vertical Hall Ammonia Compressors, single cylinder, belt driven cylinders 3 in. to 5 in. bore.
2 Alfa-Laval Disc Separators, belt driven, size 45 and 65, with chambers 12 in. and 15 in. dia.
2 unused belt driven Ram Pumps, fitted one ram 1½ in. dia., 3 in. stroke, brass fitted.
Alpine type Perplex Grinder, chamber 20 in. dia.
Ditto similar, chamber 18 in. dia.
Single pair toothed Crushing Roll, belt and gear driven last used for soap crystals.
2 Steam Jacketed Mixing Pans.
Several A.C. motors, 3–10 h.p.
21—3 gallon capacity Ball Mills.
4 Mather & Platt Colloid Mills.
460 ft. B.B. Gravity Conveyor, steel rollers, 14 in. long by 6 in. pitch
Torrance Positive-geared Edge Runner Mill.
5 Riveted Vessels, partly jacketed and plain, with agitators and coils, as used in oil-refining trade.
3 Miracle Super Hammer Mills, size 3W, each with 65 H.P. A.C. Motor, vee rope drive, cyclone, fan and all belongings.
2 Various Werner Pfleider Mixers, size 16 and 17, double 'Z' arms, both plain and steam jacketed types.
Gardner Rapid Sifter Mixer, 4 ft. long.
Gardner 10 ft. steam jacketed Dryer.

Write: RICHARD SIZER LIMITED, ENGINEERS CUBER WORKS HULL

NEW STAINLESS STEEL PLANT FOR ALL NEEDS
with quick delivery
Boiling Pans, Tanks of all shapes and sizes
Dyeing and **Drying Racks**
Stainless Steel Buckets
Steam heated vacuum Driers
Acid resisting enamelled ware

We also specialise in finding unusual second-hand items for our customers. If you do not receive our Monthly List please let us have your address. We are not dealers but sell plant on commission. May we help you?

R. F. PAGET Ph.D., C.C.I.
Chemical Engineer
Manor House, Barwick-in-Elmet, Leeds
Tel. Barwick-in-Elmet 216

FOR SALE

SIMON TWIN ROLLER DRUM DRIER, with steam-heated rolls, 2 ft. 4 in. diam. by 5 ft. long; drive through spur gearing with countershaft and complete with fast and loose pulleys.
BROADBENT 48-in. SUSPENDED TYPE HYDRO EXTRACTOR, overdriven from 15 h.p. motor 400/3/50 supply, together with Pony motor for slow running.
BROADBENT 48-in. HYDRO EXTRACTOR; three-point suspension, galvanised basket and complete with 15 h.p. motor, starting equipment and reverse current braking switch suitable for 400/440 volt 3-phase 50-cycle supply.
JOHNSON TIMBER PLATE AND FRAME FILTER PRESS, 28 plates and 29 frames, cakes 2 ft. 1 in. sq. by 1½ in. closure. (Two available.)
18-in. diam. WILKINSON OINTMENT MILL, with marble refining discs and enamelled hopper and agitator, and complete with driving motor.
TUNGSTONE ACID PUMPS. A number available in Ebonite, Bronze and Tufnol.
SILICA COILS of 2½ in. bore, comprising 60 ft. formed into seven turns at 2 ft. 6 in. diam., complete with teak supporting framework. (Brand new.)

NEWMAN INDUSTRIES, LIMITED. YATE, BRISTOL.

'Phone 98 Staines
TWIN Z-blade Tipping Mixer, 16 in. by 16 in. by 14 in., complete with motor, 400/3/50.
3 ft. 6 in. Single Roll Edge Runner by Torrance.
Unused Weir Tubular Condensers, 350, 160 and 120 sq. ft.
C.I. Filter Press, 30 chambers, 25 in. by 25 in.
Lab. Filter Press, 4 plate, 3 frame, with hand pump. Unused.

HARRY H. GARDAM & CO., LTD., STAINES.

HORIZONTAL PRESSURE VESSELS FOR SALE

TWO—	25′ 4″ × 4′ 6″	diam.	225 lb. w.p.
One—	24′ 4″ × 4′ 6″	diam.	200 lb. w.p.
Three—	24′ 6″ × 3′ 6″	diam.	225 lb. w.p.
One—	24′ 0″ × 3′ 6″	diam.	170 lb. w.p.
Two—	25′ 0″ × 4′ 6″	diam.	60 lb. w.p.
One—	18′ 6″ × 2′ 11″	diam.	80 lb. w.p.
75—	8′ 8″ × 5′ 5″	diam.	75 lb. w.p.
50—	4′ 0″ × 1′ 6″	diam.	175 lb. w.p.

GEORGE COHEN SONS & CO. LTD., WOOD LANE, LONDON, W.12. and STANNINGLEY, NR. LEEDS.

WERNER double "Z" Mixer, tilting pan, 33 in. by 33 in. by 28 in. deep. Another size 18 in. by 18 in. by 16 in. deep.
C.I. Vertical Mixer, 120 galls, bottom discharge, with horizontal blades and scrapers. "U" TROUGH Powder Mixers, 300 and 150 lb. sizes.
Combined SIFTER-MIXERS, 600 and 400 lb. sizes.
MANLOVE Hydro, Swan neck, with 30 in. perforated cage.
BRADFORD Hydro, 26 in. perforated cage, electric driven, 400/3/50 cycles.
POLFORD 1 cwt. Core Sand Mixer, electric driven, 400/3/50 cycles.

WINKWORTH MACHINERY
65 High Street, Staines.
Tel. 1010

8 Copper Melting Pans jacketed, 18 in. diam. by 12 in. deep, with covers, mounted in steel frames with valves, etc. (new condition). THOMPSON & SON (MILLWALL) LTD., **Cuba Street, Millwall, E.14.**

1000 STRONG NEW WATERPROOF APRONS. To-day's value 5s. each, Clearing at 30s. dozen. Also large quantity Filter Cloths, cheap. Wilsons, Springfield Mills, Preston, Lancs. Phone 2198.

Printed in Great Britain by THE PRESS AT COOMBELANDS, Ltd., Addlestone, and published by BENN BROTHERS LTD., at Bouverie House, 154, Fleet Street, E.C.4, 28 May, 1949. Registered at the General Post Office. Entered as Second Class Matter at the New York, U.S.A., Post Office.